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BULLETIN

OF THE

New York State Museum

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No. 8

SEPTEMBER, 1889

BOLETI OF THE UNITED STATES

By CHARLES H. PECK

STATE BOTANIST

ALBANY
UNIVERSITY OF THE STATE OF NEW YORK
1889

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BOLETI OF THE UNITED STATES

Boleti are such fleshy and perishable fungi and in the dried state generally lose so much of their natural color and character that their study is attended with some difficulty. This difficulty has in some cases been increased by imperfect and incomplete descriptions and unsatisfactory classification. Professor Fries, than whom probably no one has had a better knowledge of them, says "no genus has given me more trouble than that of the Boleti." The following pages are the result of a desire on the part of the writer to facilitate the study of the United States species by bringing together the descriptions of them, and arranging them in their respective tribes or groups. In the Hymenomycetes Europæi one hundred species are recorded, in the following pages one hundred and ten. Doubtless this number will gradually be increased with the advance of our knowledge of this part of our flora, for many parts of our country yet remain to be mycologically explored. Thirty-six of the species here described occur also in Europe. The large number remaining indicates a rich and a peculiar boletous flora. It has been necessary to institute two tribes, not represented in Europe, for the reception of species for which no place is found among the Friesian tribes. A few species have been left unclassified in consequence of the imperfect character of their descriptions. A few unpublished species

represented by scanty material in an unsatisfactory condition have been omitted.

The genera Boletinus and Strobilomyces are not very sharply distinguished from the genus Boletus, and Professor Fries did not attribute generic value to them. But one character ascribed to both of them in Sylloge Fungorum conflicts to such an extent with the Friesian description of the genus Boletus that it may be well to recognize them as distinct. This distinctive character is expressed in the following

Synopsis of the Genera

Tubes easily separable from the hymenophore and from each other	Boletus.
Tubes not easily separable from the hymenophore	1
1. Hymenium with a perceptible radiating structure	Boletinus.
1. Hymenium without a perceptible radiating structure.	Strobilomyces.

BOLETINUS Kalchb.

Hymenophore not even (as in Boletus) but extended in mucros descending like a trama among the tubes. Tubes not easily separable from the hymenophore and from each other. Stem annulate, hollow, spores pale yellowish. Sylloge Vol. VI, p. 51.

This genus was founded by Kalchbrenner on *Boletus cavipes* Opat., the only European representative of it. His diagnosis differs slightly from the one quoted in saying that the tubes are not separable from the hymenophore nor from each other, and that the stem is central and the fungus fleshy and putrescent. Fries, who apparently had not seen this fungus, says, with characteristic sagacity, that from the character given, it constitutes a peculiar genus whose whole appearance is that of Boletus and whose limits are not yet defined.

In the United States there are several species which evidently should be referred to this genus. By a study of them it becomes clear that Fries was right in his assertion and that a very important generic character has been overlooked. This is the radiating structure of the hymenium which is

composed of several broader radiating lamellæ abundantly connected by more narrow transverse and anastomosing branches or partitions which thus form large angular pores whose dissepiments are more or less uneven or dentate on the edge. The radiating lamellæ are more distinct toward the stem, and gradually lose themselves toward the margin. In some species they are more clearly seen in the young plant than in the adult. The hymenium is to some extent separable from the hymenophore, though not easily, but in the young plant, at least of one species, I found it inseparable. The projecting mucros or points, appearing not unlike pale scattered hairs, are not, in my opinion, a good generic character, for I have observed them in many species whose tubes easily separate from the hymenophore and from each other and which therefore are genuine Boleti. The characters ascribed to the stem are also not of generic value and should be omitted if we accept the evidence of our American species. In one species, *Paxillus porosus* Berk., the stem is lateral or eccentric, and by this character and by the peculiar radiating structure of the hymenium this genus is shown to be intermediate between Paxillus and Boletus. It affords a resting place for the species just mentioned, for it seemed before to be at home neither with the Paxilli nor with the Boleti. The generic diagnosis should in my opinion be emended as follows:

Hymenium lamellis latioribus radiantibus transversé connexis ramis angustioribus numerosissimis anastomosantibus formatum. Tubuli subtenaces, ægre ab hymenophoro et a se invicem sesedentes, magni, angulati, adnati vel subdecurrentes, lutescentes.

Hymenium composed of broader radiating lamellæ connected by very numerous more narrow anastomosing branches or partitions and forming large angular pores. Tubes somewhat tenacious, not easily separable from the hymenophore and from each other, adnate or subdecurrent, yellowish.

	Stem hollow	B. cavipes
	Stem solid	1
1	Stem lateral or eccentric	B. porosus
1	Stem central	2
2	Pileus pale yellow, silky	B. decipiens
2	Pileus red or adorned with red scales	3
3	Pileus red	B. paluster
3	Pileus soon red-squamose	B. pictus

Boletinus cavipes Kalchb.

Hollow-stemmed Boletinus

Icon. Sel. Hym. Hung. p. 52, tab. 31. *Boletus cavipes* Opat. Comm. p. 11 *Boletus subtomentosus* Report 23, p. 131. *Boletus ampliporus* Rep. 26, p. 67

Pileus broadly convex, rather tough, flexible, soft, subumbonate, fibrillose-squamulose, tawny-brown, sometimes tinged with reddish or purplish, flesh yellowish; tubes slightly decurrent, at first pale yellow, then darker and tinged with green, becoming dingy-ochraceous with age; stem equal or slightly tapering upward, somewhat fibrillose or floccose, slightly annulate, *hollow*, tawny-brown or yellowish-brown, yellowish at the top and marked by the decurrent dissepiments of the tubes, white within; veil whitish, partly adhering to the margin of the pileus, soon disappearing; spores .0003 to .0004 inch long, .00016 broad.

Pileus 1.5 to 4 inches broad; stem 1.5 to 3 in. long, 3 to 6 lines thick. Swamps and damp mossy ground under or near tamarack trees. New York, *Peck*. New England, *Frost*.

The pileus is clothed with a fibrillose tomentum which becomes more or less united into floccose tufts or scales. The umbo is not always present and is generally small. The young stem may sometimes be stuffed, but if so, it soon becomes hollow, though the cavity is irregular. The freshly shed spores have a greenish-yellow or olivaceous hue, but in time they assume a pale or yellowish-ochraceous hue. This species is apparently northern in its range. It loves cold sphagnous swamps in mountainous regions.

Boletinus pictus Pk.

Painted Boletinus

Boletus pictus Rep. 23, p. 128. *Boletus Spraguei* B. & C., Grevillea, Vol. I, p. 35

Pileus convex or nearly plane, at first covered with a *red fibrillose tomentum which soon divides into small scales revealing the yellow color of the pileus beneath*, flesh yellow, often slowly changing to dull pinkish or reddish tints where wounded; tubes tenacious, at first pale-yellow, becoming darker or dingy ochraceous with age, sometimes changing to pinkish-brown where bruised, concealed in the young plant by the copious whitish webby veil; stem equal or nearly so, *solid*, slightly and somewhat evanescently annulate, clothed and colored like or a little paler than the pileus, yellowish at the top; spores ochraceous, .00035 to .00045 in. long, .00016 to .0002 broad.

Pileus 2 to 4 in. broad; stem 1.5 to 3 in. long, 3 to 6 lines thick.

Woods and mossy swamps. New York, *Peck.* New England, *Sprague, Frost.* North Carolina, *C. J. Curtis.*

This species is easily recognized by the beautiful red scales of the pileus which are more distinct by contrast with the yellowish background. The colors are not well retained by the dried specimens. The flesh is yellow, but on exposure to the air it sometimes slowly assumes pinkish reddish or garnet tints. In *B. Spraguei*, it is said to vary from yellow to purplish. As I can detect no other marked difference in the description of that species, it does not seem to me to be specifically distinct, and especially so because this character is clearly a variable one in *B. pictus.* The more prominent radiating lamellæ are less distinct in this species than in the others, but they are generally perceptible in the young hymenium. The plant is common in New York and grows especially in pine woods.

Boletinus paluster Pk.

MARSH BOLETINUS

Boletus paluster Rep. 23, p. 132, pl. 6, figs. 4 to 7

Pileus thin, broadly convex, plane or slightly depressed, sometimes with a small umbo, floccose-tomentose, *bright-red;* tubes very large, slightly decurrent, yellow, becoming ochraceous or dingy ochraceous; stem slender, solid, subglabrous, red, yellowish at the top; spores pinkish-brown, .0003 to .00035 in. long, .00016 broad.

Pileus 1 to 2 in. broad; stem 1 to 2 in. long, 2 to 3 lines thick.

Wet places and sphagnous mossy swamps. New York, *Peck.* Maine, *Harvey.*

This is a small but pretty fungus which inhabits cold mossy swamps and is somewhat gregarious in its mode of growth. Sometimes it grows on decaying moss-covered sticks or prostrate trunks. The color of the spores is peculiar, being a dull purplish or pinkish-brown, quite unlike that of the other species. The mouths of the tubes are large for the size of the plant, and the radiating lamellæ are plainly visible. The umbo is small and not always present. The red color of the pileus is apt to fade with age or to become tinged with yellow.

Boletinus decipiens Pk.

DECEIVING BOLETINUS

Boletus decipiens, B. & C., Ann. Mag. Nat. Hist. 1853, p. 14

Pileus dry, minutely silky, *whitish-yellow or pale-buff*, flesh buff, one-third in. thick; hymenium plane or somewhat concave, yellow, consisting of large, unequal flexuous radiating tubes resembling multiseptate lamellæ; stem equal, solid but spongy; veil floccose, evanescent, adhering for a

time to the margin of the pileus; spores rather minute, oblong, *ochraceo-ferruginous*, .0003 to .0004 in. long, .00014 to .00016 broad.

Pileus 2 in. broad; stem 2 to 2.5 in. long, 3 to 4 lines thick.

Thin woods. North and South Carolina, *M. A. Curtis.*

Specimens of this species have not been seen by me. The authors remark that its affinities are clearly with *Boletus flavidus* and its allies, from which it is distinguished by its large radiating pores. They also say that when dry it is scarcely distinguishable from *Paxillus porosus* Berk., except by its spores. This would imply that its stem is eccentric or lateral and I have been informed by Mr. Ravenel that it is sometimes so. But specimens of this kind, labeled *Boletus decipiens* B. & C., have been received which show by their spores that they are *Paxillus porosus.* Besides, Prof. Farlow informs me that authentic specimens of *B. decipiens* in the Curtisian Herbarium have only central stems, from which things I suspect that the two species have been confused. The spore dimensions here given are derived from a specimen in the Curtis Herbarium, through the kindness of Prof. Farlow.

Boletinus porosus Pk.

Eccentric-stemmed Boletinus

Paxillus porosus Berk., Cat. Cinn. Plants, p. 54. *Boletus lateralis* Bundy, Geol. Wisconsin, Vol. I, p. 398.

Pileus fleshy, viscid when moist, shining, reddish-brown, flesh three to nine lines thick, the margin thin and even; hymenium porous, yellow, formed by radiating lamellæ a line to half a line distant, branching and connected by numerous irregular veins of less prominence and forming large angular pores; stem lateral, tough, diffused into the pileus, reticulated at the top by the decurrent walls of the tubes, colored like the pileus; spores semiovate.

Pileus 2 to 5 in. broad; stem 6 to 16 lines long, 4 to 6 lines thick.

Var. *opacus* (*Paxillus porosus* Berk. Bull. N. Y. State Mus. 2, p. 32). Pileus dry, glabrous or subtomentose, not shining, brown or tawny brown; spores brownish-ochraceous, .00035 to .00045 in. long, .00024 to .00032 broad.

Damp ground in woods and open places. Ohio, *Lea, Morgan.* North Carolina, *Curtis.* New England, *Frost, Farlow.* Wisconsin, *Bundy.* New York, *Peck.*

This species is remarkable for its lateral or eccentric stem. There is often an emargination in the pileus on the side of the stem which gives it a reniform shape. In the typical form it is described as viscid when moist, and the Wisconsin plant is also described as viscid, but in all the New York specimens that I have seen it is dry and sometimes minutely tomentose. I have therefore separated these as a variety. The color of the pileus varies from yellowish-brown to reddish-brown or umber. A disagreeable odor is sometimes present. The tubes are rather short and tough and do not easily separate from the hymenophore and from each other. In the young plant they are not separable. They sometimes become slightly blue where wounded. As in other species they are pale yellow when young but become darker or dingy-ochraceous with age. The spores have been described as "bright yellow," but I do not find them so in the New York plant. The plant is incongruous among the Paxilli by reason of its wholly porous hymenium, but in this place it seems to be among its true allies.

BOLETUS Dill.

Hymenium composed of easily separable tubes, distinct and easily separable from the hymenophore. Tubes crowded into a porous stratum without a trama, their mouths either round or angular pores. Spores normally fusiform, rarely oval or subrotund.

Terrestrial, fleshy, putrescent, centrally stipitate fungi; many of them valuable for their esculent qualities, a few poisonous. Hym. Eur. p. 495.

This genus abounds in species and is related to Boletinus on one hand and to Polyporus on the other. From the latter it is distinguished by the absence of a trama and from both by the tubes being easily separable from the hymenophore and from each other. Some of the species are very variable, others are so closely allied that they appear almost to run together.

Most of our Boleti, appear in the warmest part of the season and especially in very warm showery weather. They are scarce in a dry time. In this latitude a few common species may be found from June to October, but most of them occur only during July and August. Some species, like *B. edulis*, *B. eximius* and *B. felleus* occasionally attain a very large size; others exhibit a singular change of color in their tubes or flesh where these have been wounded. The pileus is generally so fleshy that it is apt to be infested by the larvæ of insects, and that it is difficult to dry specimens so that they shall retain their size, shape and colors.

The species are generally terrestrial, but *B. hemichrysus* is habitually lignicolous, and others are occasionally so.

The spores vary in color in such closely related species that this character is scarcely available for general classification, but it is valuable as a specific character and should always be noted.

The color of the dry spores sometimes differs slightly from that of fresh ones, greenish tints often disappearing in old and dried spores. The color of the hymenium is often paler in the young plant than it is in the old one. Fries has divided the genus into two series depending on the color of the young hymenium, but this division sometimes widely separates species that are evidently closely related. It has not therefore been fully followed in the present arrangement. Some of the Friesian tribes or sections also are so

closely related and seem to blend so imperceptibly into each other that a species in some instances might with almost equal propriety be placed in either of two sections. In the synoptical table of the sections, therefore, repetitions have in some instances been necessary.

Synopsis of the Tribes.

	Pileus and stem yellow-pulverulent, stem not reticulated with veins	Pulverulenti.
	Pileus and stem not yellow-pulverulent, or if so then the stem reticulated with veins	1
1.	Tubes yellowish with reddish, or reddish-brown mouths.	Luridi.
1.	Tubes of one color, or mouths not reddish	2
2.	Stem lacunose-reticulated and lacerated	Laceripedes.
2.	Stem reticulated with veins, not lacerated	3
2.	Stem not reticulated	5
3.	Tubes white, becoming flesh-colored	Hyporhodii.
3.	Tubes not becoming flesh-colored	4
4.	Tubes free, or if adnate then stuffed when young	Edules
4.	Tubes adnate, not stuffed when young	Calopodes.
5.	Pileus viscid or glutinous when moist	6
5.	Pileus dry	7
6.	Tubes adnate	Viscipelles.
6.	Tubes free or nearly so, yellowish	Edules.
6.	Tubes free or nearly so, whitish	Versipelles.
7.	Stem solid	8
7.	Stem spongy within, soon cavernous or hollow	Cariosi.
8.	Tubes becoming flesh-colored	Hyporhodii.
8.	Tubes not becoming flesh-colored	9
9.	Tubes adnate	10
9.	Tubes free or nearly so	11
10.	Pileus subtomentose	Subtomentosi.
10.	Pileus glabrous or pruinose	Subpruinosi.
11.	Tubes yellowish or stuffed when young	Edules.
11.	Tubes whitish, not stuffed	Versipelles.

VISCIPELLES

Pileus covered with a viscose pellicle. Stem solid, neither bulbous, lacerated nor reticulated with veins. Tubes adnate, rarely sinuate, of one color.

The viscid or glutinous character of the pileus in connection with the stem and tubes distinguishes the species of this tribe. Viscid species in other tribes have the stem either bul-

bous, pulverulent, lacerated or reticulated or the mouths of the tubes differently colored. In most species the viscid pellicle is separable from the flesh, which is often, in mature plants, of a soft and almost floccose or cottony texture. The tubes are generally adnate or even slightly decurrent. In the latter case the extreme top of the stem may be marked or slightly reticulated by the decurrent walls of the tubes. In rare instances the hymenium may be slightly depressed or sinuate around the stem. In some the color of the wounded tubes changes slightly, but in rare instances only does it become blue. The mouths of the tubes are often angular and the edges of the dissepiments dentate or uneven. Yellow or ochraceous hues prevail, but the young tubes are usually paler than the mature ones. The stem in some species is annulate, in others exannulate. In several closely allied central species of the tribe it, as well as the tubes, exudes drops of a thick gummy or turbid fluid which soon hardens, becomes darker in color and forms granules or glandular dots. I have not observed this character in the species of any other tribe.

The color of the spores as shown when shed upon white paper is some shade of yellow or ochraceous, ferruginous or brown. Several of the species have been recorded as edible. Nearly all of them occur in districts that now are, or formerly were inhabited by pine or other coniferous trees, and are wanting or scarce in other localities.

The first four and several of the final species here described recede somewhat from the character of the central or typical species of the group.

	Stem with an annulus	1
	Stem without an annulus	9
1.	Stem dotted both above and below the annulus	2
1.	Stem dotted above the annulus	3
1.	Stem not dotted	4
	2. Tubes salmon color	B. salmonicolor.
	2. Tubes yellowish	B. subluteus.
3.	Annulus entirely viscose	B. flavidus.
3.	Annulus membranous, fugacious	B. elegans.

3. Annulus membranous, persistent	B. luteus.
4. Pileus squamose	B. spectabilis.
4. Pileus not squamose	5
5. Tubes whitish or grayish	6
5. Tubes yellow or yellowish	7
6. Flesh white, unchangeable	B. Elbensis.
6. Flesh white, changing to bluish	B. serotinus.
7. Spores globose or broadly elliptical	B. sphærosporus
7. Spores much longer than broad	8
8. Annulus fugacious	B. flavus.
8. Annulus persistent	B. Clintonianus.
9. Stem dotted with glandules	10
9. Stem not dotted	16
10. Pileus some shade of yellow	11
10. Pileus some other color	15
11. Stem rhubarb color	B. punctipes.
11. Stem some other color	12
12. Stem four lines or more thick	13
12. Stem less than four lines thick	B. Americanus.
13. Pileus adorned with tufts of hairs or fibrils	B. hirtellus.
13. Pileus glabrous	14
14. Stem yellow within	B. subaureus.
14. Stem whitish or yellowish-white within	B. granulatus.
15. Pileus white	B. albus.
15. Pileus not white	B. granulatus.
16. Stem squamulose	17
16. Stem not squamulose	18
17. Pileus dull red	B. dichrous.
17. Pileus some other color	B. collinitus.
18. Pileus yellow	19
18. Pileus bay-red or chestnut	20
18. Pileus some other color	21
19. Flesh pale-yellow	B. unicolor.
19. Flesh white	B. bovinus.
20. Stem short, one inch or less	B. brevipes.
20. Stem longer, two inches or more	B. badius.
21. Tubes olivaceous or golden-yellow	B. mitis.
21. Tubes ferruginous	22
22. Taste mild	B. rubinellus.
22. Taste acrid or peppery	B. piperatus.

A. *Stem annulate.*

Boletus spectabilis Pk.

Showy Boletus

Report 23, p. 128, Pl. 6, figs. 1 to 3. Bulletin N. Y. State Museum No. 2, p. 59.

Pileus broadly convex, *at first covered with a red tomen-*

tum, then squamose, viscid when moist, *red*, the tomentose scales becoming grayish-red, brownish or yellowish, flesh whitish or pale-yellow; tubes at first yellow and concealed by a reddish glutinous membrane, then ochraceous, convex, *large, angular*, adnate; stem nearly equal, annulate, yellow above the annulus, red or red with yellow stains below; spores *purplish-brown*, .0005 to .0006 in. long, .00025 to .00028 broad.

Pileus 2 to 5 in. broad; stem 3 to 5 in. long, 4 to 6 lines thick.

Thin woods in swamps. New York, *Peck*. Wisconsin, *Bundy*.

This is a rare and showy species which inhabits the cold northern swamps of the country. It probably extends into Canada. When cut, the flesh emits a strong unpleasant odor. Wounds of the flesh made by insects or other small animals have a bright yellow color. When young, the tomentose veil covers the whole plant, but it soon parts into scales on the pileus and partly or wholly disappears from the stem. The species is apparently allied to *B. tridentinus* Bres., from which it differs in the color of its flesh, veil, tubes and spores. The color of the latter is darker than in any other species of this tribe known to me. It approaches mummy-brown but has a slight purplish tint.

Boletus Elbensis Pk.

ELBA BOLETUS

Rep. 23, p. 129. Bull. N. Y. S. Mus. 2, p. 60.

Pileus convex, glabrous, viscid when moist, *dingy-gray or pinkish-gray* inclining to brownish, obscurely spotted or streaked as if with patches of innate fibrils, flesh white; tubes at first whitish, becoming dingy or brownish-ochraceous, nearly plane, adnate or slightly decurrent, rather large, angular; stem nearly equal, annulate, *whitish above the*

annulus, colored like the pileus below, sometimes slightly reticulated at the top; spores *ferruginous-brown*, .0004 to .0005 in. long, .00016 to .0002 broad.

Pileus 2 to 4 in. broad; stem 3 to 5 in. long, 4 to 6 lines thick.

Thin woods of tamarack, spruce and balsam. New York, *Peck.*

This species is so closely related to the European *B. laricinus* that it might easily be considered an American form of that species or at most a variety of it. I have not seen its pileus squamose nor its stem scrobiculate and therefore for the present keep it distinct. The spores are a much paler brown than those of *Agaricus campestris*, and incline toward ferruginous. The Friesian arrangement would require this species to be placed among the Favosi, but its affinities appear to me to be with the Viscipelles. Its locality is thus far limited to the Adirondack region of this State.

Boletus serotinus Frost

Late Boletus

Bulletin Buffalo Society Nat. Sci. 1874, p. 100.

Pileus flat or convex, viscid, sordid brown, streaked with the remnants of the veil, especially near the margin which is white, very thin, and when partly grown singularly pendent, flesh white, *changing to bluish;* tubes large, angular, unequal, slightly decurrent, at first sordid white or gray, sometimes tinged with green near the stem, afterward cinnamon-yellow; stem reticulated above the annulus which adheres partly to it and partly to the margin of the pileus, white but stained by the brownish spores and tinged with yellow at maturity; spores .0004 in. long, .00025 broad.

Shaded grassy ground. New England, *Frost.*

Probably this is only a variety of the preceding species,

but it is apparently well marked by the change in the color of the flesh. Specimens not seen.

Boletus salmonicolor Frost

Salmon-colored Boletus

Bull. Buff. Soc. Nat. Sci. 1874, p. 100.

Pileus convex, soft, very glutinous, brownish or tawny-white with a faint tinge of red, wine color when dry, the margin thin, *flesh tinged with red;* tubes simple, even, angular, adnate, *pale salmon color;* stem small, dotted above with bright ferruginous red, sordid below, annulus *dingy salmon color;* spores .00032 in. long, .0001 broad.

Borders of pine woods. New England, *Frost.*

Apparently a distinct species. No specimens seen.

Boletus elegans Schum.

Elegant Boletus

Hym. Eur., p. 497. Syl. Fung. Vol. VI, p. 3.

Pileus convex or plane, viscose, *golden-yellow or somewhat ferruginous*, flesh pale-yellow; tubes decurrent, golden or sulphur-yellow, the mouths minute, simple; stem unequal, firm, golden or rufescent, *dotted above the fugacious white or pale-yellowish annulus.*

Pileus 3 to 4.5 in. broad; stem 2 to 4 in. long.

Woods, especially under or near larch trees. North Carolina, *Curtis.* Wisconsin, *Bundy.* Minnesota, *Johnson.*

I have seen no specimens of this species. In Sylloge the spores are said to be ellipsoid or oblong-ellipsoid, .0003 to .00035 in. long, .00012 to .00018 broad. According to Cordier and Gillet, the species is edible though not delicate.

Boletus Clintonianus Pk.

Clinton's Boletus

Rep. 23, p. 128. Bull. N. Y. S. Mus. 2, p. 60. *Boletus viridarius* Frost, Bull. Buff. Soc. p. 100.

Pileus convex, very viscid or glutinous, glabrous, soft, shining, *golden-yellow, reddish-yellow or chestnut color*, the margin thin, flesh pale-yellow, becoming less bright or dingy on exposure to the air; tubes nearly plane, adnate or subdecurrent, *small*, angular or subrotund, pale-yellow, becoming dingy-ochraceous with age, *changing to brown or purplish-brown where bruised;* stem equal or slightly thickened toward the base, straight or flexuous, *yellow at the top*, reddish or reddish-brown below the annulus, sometimes varied with yellow stains, the annulus white or yellow, *persistent*, forming a thick band about the stem; spores *brownish-ochraceous*, .0004 to .00045 in. long, .00016 to .0002 broad.

Pileus 2 to 5 in. broad; stem 2 to 5 in. long, 4 to 9 lines thick.

Mossy or grassy ground in woods or open places, especially under or near tamarack trees. New York, *Peck.* New England, *Frost.*

This is apparently closely related to *B. elegans*, from which it differs in its thick persistent annulus, in its stem which is not at all dotted and in its longer and darker colored spores. Its smaller tubes and persistent annulus separate it also from *B. flavus.* In the typical form the pileus is bay-red or chestnut color, but plants growing in open places generally have it yellow or reddish-yellow. It is mild to the taste and I have eaten it sparingly. It sometimes grows in tufts.

Boletus flavus With.

LIGHT-YELLOW BOLETUS

Hym. Eur. p. 497. Syl. Fung. Vol. VI, p. 4.

Pileus convex, compact, covered with a brownish separating gluten, *pale-yellow*, flesh pale-yellow; tubes large, angular, adnate, yellow; stem yellow becoming brownish, reticulated above the *membranous fugacious* dirty yellowish annulus; spores .0003 to .0004 in. long, .00012 to .00016 broad.

Pileus 2 to 5 in. broad; stem 2 to 3 in. long, 6 to 10 lines thick.

Woods. Minnesota, *Johnson.* Wisconsin, *Bundy.*

This is apparently a rare species in this country. I have not seen it. It is said to resemble *B. luteus*, from which it is separated by the large angular mouths of the tubes. In British Fungi the spores are described as "spindle-shaped, yellowish-brown;" in Sylloge, as "ovoid-oblong, acute at the base, granulose, pale ochraceous."

Boletus sphærosporus Pk.

GLOBOSE-SPORED BOLETUS

Bulletin Torrey Botanical Club, Vol. XII, p. 33.

Pileus at first hemispherical, then convex, glabrous, viscid, creamy-yellow, becoming reddish-brown or chestnut color with age, flesh pale yellowish-brown; tubes adnate or slightly decurrent, large, angular, pale-yellow, becoming brown, sometimes tinged with green; stem stout, equal, even or slightly reticulated at the top, the *membranous annulus persistent*, sometimes partly adhering to the margin of the pileus; spores *globose or broadly elliptical*, .0003 to .00035 in. long.

Pileus 3 to 8 in. broad; stem 1 to 3 in. long, 6 to 12 lines thick.

Low ravines and sandy places. Wisconsin, *Trelease.* Iowa, *McBride.*

The spores easily serve to distinguish this species from its allies. The European *B. sphærocephalus* has ovoid spores, but its tube mouths are minute and rotund and its stem is densely squamose.

Boletus luteus L.

YELLOW-BROWN BOLETUS

Hym. Eur. p. 497. Syl. Vol. VI, p. 3. *Boletus annulatus* Syn. Fung. Car. 854. Pers. Syn. p. 503.

Pileus gibbous or convex, covered with a brownish separating gluten, becoming yellowish-brown and virgate-spotted, flesh white; tubes adnate, minute, simple, yellow, becoming darker with age; stem *stout*, yellowish and *dotted above* the large membranous brownish-white annulus, brownish-white or yellowish below; spores fusiform, yellowish-brown, .00025 to .0003 in. long, .00012 to .00015 broad.

Pileus 2 to 5 in. broad; stem 1 to 2 in. long, 6 to 10 lines thick.

Pine woods and groves. New York, *Peck.* Pennsylvania, *Schweinitz.* New England, *Frost.* North Carolina, *Curtis. Schweinitz.* California. *Harkness, Moore.* New Jersey, *Ellis.*

This is separated from *B. elegans* by its darker and more dingy colors and its large persistent annulus, from *B. Clintonianus,* by its colors and its stem dotted at the top. In some specimens the annulus appears to sheath the lower part of the stem, resembling in this respect the western *B. sphærosporus.* In others, it forms a broad band with the upper margin widely spreading. In dried specimens the pileus generally assumes a dull brownish or reddish-brown hue.

Most authors say it is edible. Fries remarks that it is

excellent; Cordier, that he has eaten it and finds it good; Gillet, that it is extensively consumed in Germany; Curtis that it is edible, and the writer has eaten it. Stevenson says it is edible and highly esteemed like other Boleti, that the flesh is tender but the tubes should be scraped away, as in all the species, before cooking.

The species is rare in this state, and it is clear that *B. subluteus* has in some instances been confused with it, as is shown by specimens received from Mr. Frost.

Boletus subluteus Pk.

Small yellowish Boletus

Bull. N. Y. S. Mus. 2, p. 62. *Boletus luteus*, Rep. 23, p. 128. Cat. Buff. Plants, p. 118.

Pileus convex or nearly plane, viscid or glutinous when moist, often obscurely virgate-spotted, dingy yellowish, inclining to ferruginous-brown, flesh whitish varying to dull yellowish; tubes plane or convex, adnate, small, subrotund, yellow becoming ochraceous; stem equal, *slender*, pallid or yellowish, *dotted both above and below* the annulus with reddish or brownish glandules, annulus submembranous, *glutinous*, at first concealing the tubes, then generally collapsing and forming a narrow whitish or brownish band around the stem; spores subfusiform, ochraceo-ferruginous, .0003 to .0004 in. long, .00016 to .0002 broad.

Pileus 1.5 to 3 in. broad; stem 1.5 to 2.5 in. long, 2 to 4 lines thick.

Sandy soil in pine woods. New York, *Peck, Clinton.* New England, *Frost.*

The species is closely related to *B. luteus*, from which it differs in its smaller size, more slender stem and glutinous collapsing veil. This does not cover the lower part of the stem like a sheath, but forms a narrow band with scarcely any spreading margin. Besides, the stem is conspicuously dotted both above and below the annulus. The markings

of the pileus in this species, *B. luteus* and *B. Elbensis* are similar and resemble little patches of innate brownish fibrils.

Boletus flavidus Fr.

Pale-yellow Boletus

Hym. Eur. p. 498. Syl. Fung. Vol. VI, p. 4. *Boletus velatus* Pers. Myc. Eur. Vol. II, p. 125, tab. 20, figs. 1 to 3.

Pileus thin, gibbous, then plane, viscose, livid, yellowish, flesh *pallid;* tubes decurrent, with *large angular compound mouths*, dirty yellowish; stem *slender*, subequal, pallid, sprinkled with *fugacious glandules above the entirely viscose* annulus; spores oblong-ellipsoid, straight, subhyaline, .0003 to .0004 in. long, .00014 to .00016 broad.

Pileus 1 to 2 in. broad; stem 2 to 3 in. long, 2 to 3 lines thick.

Pine woods and swamps. Pennsylvania, *Schweinitz.* North Carolina, *Curtis.* New England, *Frost.* California, *Harkness, Moore.* Rhode Island, *Bennett.*

Fries says that this species is more slender than its allies and differs from them all in its merely glutinous veil. The veil of *B. velatus*, which species he considers the same as this, is described as mucous and at first concealing the tubes, but in the adult plant remaining as a brown spot on the stem. The latter is not represented in Persoon's figure as dotted.

According to Dr. Curtis the plant is edible.

B. *Stem not annulate.*

a Stem glandular-dotted.

Boletus Americanus Pk.

American Boletus

Bull. N. Y. S. Mus. 2, p. 62. *Boletus flavidus* Rep. 23, p. 129. Cat. Buff. Plants, p. 118.

Pileus thin, convex or nearly plane, sometimes umbonate,

soft, very viscid or glutinous when moist, *slightly tomentose on the margin when young*, soon glabrous or the margin sometimes remaining squamose, rarely squamose-spotted from the drying of the gluten, yellow, becoming dingy or less bright with age, sometimes vaguely dotted or streaked with bright red, flesh pale-yellow, less clear or pinkish-gray on exposure to the air; tubes plane or convex, adnate, *rather large*, angular, pale-yellow, becoming sordid-ochraceous; stem *slender*, equal or slightly tapering upward, firm, *not at all annulate*, yellow, often pallid or brownish toward the base, marked with *numerous brown or reddish-brown persistent glandular dots*, yellow within; spores oblong or subfusiform, ochraceo-ferruginous, .00035 to .00045 in. long, .00016 to .0002 broad.

Pileus 1 to 3 in. broad; stem 1.5 to 2.5 in. long, 2 to 4 lines thick.

Woods, swamps and open places, especially under or near pine trees. New York, *Peck, Clinton.* Minnesota, *Arthur.*

This is one of our most common species. It is often associated with *B. granulatus*, from which it is easily distinguished by its thinner more yellow pileus and more slender stem. As in that and other closely related species the stem and tubes exude a turbid juice which soon hardens and forms the granular dots or glandules seen on them. Sometimes they are so numerous that they become confluent. By them and the viscidity of the pileus the fingers of the collector often become soiled and stained. The species is closely related to *B. flavidus*, to which our plant has commonly been referred by American mycologists, but from which it constantly differs in the character of the veil and the dots of the stem. In it the stem is dotted from top to base with persistent glandules, there is no appearance of an annulus and the veil is somewhat tomentose on the margin of the young pileus. For these reasons I have separated it from that species. Possibly some of the plants, referred above to *B. flavidus*, belong to this species. A slight subacid

odor is sometimes perceptible in our plant. It sometimes grows on much decayed wood. Its mycelium is white.

Boletus subaureus Pk.

PALE-GOLDEN BOLETUS

Rep. 39, p. 42 (in part) Bull. N. Y. S. Mus. 2, p. 63 (in part).

Pileus convex or nearly plane, viscose, pale-yellow, sometimes adorned with darker spots, the young margin slightly grayish-tomentose, flesh pale-yellow; tubes *small or medium*, somewhat angular, adnate or subdecurrent, pale-yellow becoming dingy-ochraceous; stem equal, *stout*, glandular-dotted, yellow *without and within;* spores oblong or subfusiform, ochraceo-ferruginous, .0003 to .0004 in. long, .00016 broad.

Pileus 2 to 4 in. broad; stem 1.5 to 2.5 in. long, 4 to 6 lines thick.

Thin woods and open places. New York, *Peck.* North Carolina, *C. J. Curtis.*

This plant might almost be considered a stout variety of the preceding, but in addition to its thicker pileus and stouter stem, it has smaller tubes of a clearer yellow color and the exuding drops are yellow, not whitish as in that species. In habit it appears more like *B. granulatus*, from which it is distinct in color.

Boletus hirtellus n. sp.

HAIRY BOLETUS

Boletus subaureus Rep. 39, p. 42 (in part). Bull. N.Y. S. Mus. 2, p. 63 (in part).

Pileus broadly convex, soft, viscose, golden-yellow, adorned with *small tufts of hairs or fibrils*, flesh pale-yellow; tubes adnate, medium size, angular, becoming dingy-ochraceous; stem subcæspitose, equal, stout, glandu-

lar-dotted, yellow; spores pale *ochraceous-brown*, .00035 to .0004 in. long, .00016 broad.

Pileus 2 to 4 in. broad; stem 2 to 3 in. long, 4 to 6 lines thick.

Sandy soil under pine trees. New York, *Peck.*

This species is very rare and was formerly confused with the preceding from which it is separated by the hairy adornment of the pileus and the darker more brown color of the spores.

Boletus punctipes Pk.

PUNCTATE-STEMMED BOLETUS

Rep. 32, p. 32. Bull. N. Y. S. Mus. 2, p. 64

Pileus convex or nearly plane, glutinous when moist, yellow, the thin margin at first minutely grayish-pulverulent, becoming recurved with age; tubes short, nearly plane, adnate, small, subrotund, *at first brownish*, then sordid-ochraceous; stem rather long, *tapering upward*, glandular-dotted, *rhubarb-yellow;* spores .00035 to .0004 in. long, .00016 to .0002 broad.

Pileus 2 to 3 in. broad; stem 2 to 3 in. long, 3 to 5 lines thick.

Mixed woods. New York, *Peck.*

The rhubarb colored stem and the brownish color of the young hymenium are the distinguishing features of this species. The glandules occur also on the tubes. The species is rare.

Boletus albus Pk.

WHITE BOLETUS

Rep. 23, p. 130. Bull. N. Y. S. Mus. 2, p. 64

Pileus convex, viscid when moist, *white*, flesh white or yellowish; tubes plane, small or medium, subrotund, adnate,

whitish, becoming yellow or ochraceous; stem equal or slightly tapering downward, both it and the tubes glandular-dotted, *white,* sometimes tinged with pink toward the base; spores ochraceous, subfusiform, .0003 to .00035 in. long, .00016 broad.

Pileus 1.5 to 3 in. broad; stem 1.5 to 3 in. long, 3 to 5 lines thick.

Woods, especially of pine or hemlock. New York, *Peck.* New England, *Frost.*

This species is easily known by its white pileus, but its color is lost in drying. Sometimes the fresh plant emits a peculiar fetid odor. *Boletus Boudieri* Quel. is an allied European species. *Boletus albus* Vent. equals *B. pachypus* Fr., and *B. albus* Gill. is *B. Gilletii* Sacc. & Cub.

Boletus granulatus L.

GRANULATED BOLETUS

Hym. Eur. p. 498. Syl. Fung. Vol. VI, p. 5. *Boletus circinans* Syn. Fung. Car. 858. *B. collinitus* Rep. 23, p. 129

Pileus convex or nearly plane, very viscid or glutinous and *ferruginous-brown* when moist, *yellowish* when dry, flesh pale-yellowish; tubes short, adnate, yellowish, their mouths simple, granulated; stem dotted with glandules above, pale-yellowish; spores "spindle-shaped, yellowish orange, .0003 to .0004 in. long, .0008 to .00012 broad."

Pileus 1.5 to 4 in. broad; stem 1 to 2 in. long, 4 to 6 lines thick.

Woods, especially of pine and in open places under or near pine trees. Very common. North Carolina, *Schweinitz, Curtis.* Pennsylvania, *Schweinitz.* New York, *Peck.* New England, *Frost.* New Jersey, *Ellis.* Rhode Island, *Bennett.*

The plant is generally gregarious and sometimes grows in circles whence the name *B. circinans* Pers. Occasionally it is cæspitose. The pileus is very variable in color; pink-

ish-gray, reddish-brown, yellowish-gray, tawny-ferruginous or brownish; and is sometimes obscurely spotted by the drying gluten. The flesh is rather thick and often almost white except near the tubes where it is tinged with yellow. The tubes are small, at first almost white or very pale-yellow, but they become dingy-ochraceous with age. The stem is generally short, stout and firm, whitish, pallid or yellowish, and often dotted to the base, though the glandules are more numerous and distinct on the upper part. I have quoted the spore characters as given in Sylloge and Stevenson's British Fungi, but in the American plant they appear ochraceo-ferruginous,* are .0003 to .00035 in. long, and about .00016 broad. This species and *B. Boudieri* appear to be the only European species with exannulate glandular-dotted stems. If I have correctly estimated the characters of our plants we have six such species. It is true they are closely related to each other and may possibly be regarded by some as mere varieties of a single extremely variable species, but to me, the characters that separate them, appear to be constant and decisive. Most authors, including Fries, Persoon, Cordier, Stevenson and Curtis pronounce this species edible. Gillet remarks that it should be regarded with suspicion. I have not tested it.

b. Stem not glandular-dotted.

Boletus brevipes Pk.

Short-stemmed Boletus

Rep. 38, p. 110. Bull. N. Y. S. Mus. 2, p. 65. *Boletus viscosus* Frost, Bull. Buff. Soc. p. 101

Pileus thick, convex, covered with a *thick tough gluten* when young or moist, *dark chestnut color*, sometimes fading

* In these descriptions, the color ascribed to the spores from my own observation is that of a mass of spores shed on white paper. The dimensions are taken from fresh spores or from dry ones moistened with water, and will probably exceed somewhat the dimensions of old and dried unmoistened ones.

to dingy-tawny, the margin inflexed, flesh white or tinged with yellow; tubes short, nearly plane, adnate or slightly depressed around the stem, small, subrotund, at first whitish, becoming dingy-ochraceous; stem whitish, *not dotted or rarely with a few very minute inconspicuous dots at the apex, very short;* spores subfusiform, .0003 in. long, .00012 broad.

Pileus 1.5 to 2.5 in. broad; stem .5 to 1 in. long, 3 to 5 lines thick.

Sandy soil in pine groves and woods. New England, *Frost.* New York, *Peck.*

The species is closely related to *B. granulatus*, from which it differs especially in its darker colored pileus, more copious gluten, shorter stem and the almost entire absence of granules from the tube mouths and stem. In the rare instances in which these are present they are extremely minute and inconspicuous. The plant occurs very late in the season and the pileus appears as if enveloped in slime and resting stemless on the ground.

Boletus collinitus Fr.

Smeared Boletus

Hym. Eur. p. 498. Syl. Fung. Vol. VI, p. 5

Pileus convex, even, *becoming pale when the brown gluten separates*, flesh white; tubes adnate, elongated, naked, *the mouths two-parted*, pallid, becoming yellow; stem firm, often tapering downwards, *somewhat reticulate with appressed squamules*, white, becoming brown.

Woods of pine or fir. North Carolina. *Curtis.* New England, *Frost.*

I have seen no specimens of this apparently rare species. It is said to be solitary in its mode of growth and to resemble *B. luteus* in size and color, but to be distinct from it by its ringless dotless stem. Dr. Curtis records it as edible.

Boletus dichrous Ellis

Double-colored Boletus

Bull. Torr. Bot. Club, Vol. VI, p. 109. *Boletus squamulosus* Ellis, ibid. p. 77

Pileus convex, viscose, *dull red*, flesh soft, dull yellowish-white, *changing to greenish-blue* where wounded, finally yellow; tubes subdepressed around the stem, large, unequal, straw-colored, changing color like the flesh where wounded; stem thickened below, solid, covered with a *red squamulose coat* except at the yellow apex, yellow within; spores elliptical, slightly bent at one end, .0007 in. long.

Pileus 2 to 3 in. broad; stem 3 in. long, 6 lines thick.

Dry soil in oak and pine woods. New Jersey, *Ellis.*

I have seen no specimens of this species. From the description, its affinities appear to be with *B. bicolor*, but it is placed here because of its viscose pileus.

Boletus badius Fr.

Bay Boletus

Hym. Eur. p. 499. Syl. Fung. Vol. VI, p. 7

Pileus convex, even, soft, viscose or glutinous, shining when dry, *tawny-chestnut*, flesh whitish tinged with yellow, bluish next the tubes; tubes large, angular, long, adnate or sinuate-depressed, whitish-yellow, becoming tinged with green; stem subequal, even, solid, paler, *brown-pruinate;* spores fusoid-oblong.

Pileus 2 to 3 in. broad; stem 2 to 4 in. long, 3 to 5 lines thick.

Woods, especially of pine. New York, *Peck.* Minnesota, *Johnson.* Wisconsin, *Bundy.*

According to Karsten the spores are yellowish and .0006 to .0008 in. long, .0002 to .00024 broad. Dr. Cobelli finds

them .00048 in. long, .00016 broad. In the American plant they are .0004 to .0005 in. long, .00016 to .0002 broad.

Fries in Elenchus p. 126 describes the pileus as 3 to 6 inches broad and 1 to 2 inches thick with a stem 3 inches long and 1 inch thick. The American plants which I have seen are scarcely so large. Cordier classes it among the edible species.

Boletus mitis Krombh.

Mild Boletus

Hym. Eur. p. 499. Syl. Fung. Vol. VI, p. 6

Pileus convex, then plane or depressed, firm, viscid, alutaceo-carneus, reddish-ferruginous when dry, flesh pale grayish-yellow; tubes *short, olivaceous or golden-yellow*, their mouths compound, angular, unequal; stem firm, short, even, narrowed toward the base, colored like the pileus; spores 0005 to .00055 in. long, .00016 broad.

Pileus 2 to 2.5 in. broad; stem 2 to 2.5 in. long.

Mixed woods. New England, *Frost.*

This species is unknown to me and is recorded by Mr. Frost only.

Boletus unicolor Frost Ms.

One-colored Boletus

Pileus broadly convex or nearly plane, viscid when moist, even, sometimes streaked as if with minute innate brown fibrils, *pale-yellow*, flesh *pale-yellow;* tubes adnate or slightly decurrent, rather short, compound, *lemon-yellow*, becoming darker with age; stem *even*, equal or narrowed toward the base, colored like the pileus; spores reddish-yellow, .00035 to .00045 in. long, .00016 broad.

Pileus 2 to 4 in. broad; stem 2 in. long, 4 to 6 lines thick.

Pine woods and open sedgy places. New England, *Frost.*

Specimens not seen. The species seems too near *B.*

bovinus, of which it may possibly be a variety, but its yellow flesh and the colors ascribed to the tubes and spores require its separation. Rev. C. J. Curtis sends notes of a species found by him in North Carolina, which agrees with this in its characters so far as noted.

Boletus bovinus L.

BOVINE BOLETUS

Hym. Eur. p. 499. Syl. Fung. Vol. VI, p. 6

Pileus nearly plane, glabrous, viscid, pale-yellow, flesh *white;* tubes very short, subdecurrent, their mouths compound, pale-yellow or grayish, becoming ferruginous ; stem equal, even, colored like the pileus ; spores fusiform, dingy greenish-ochre, .0003 to .0004 in. long, .00012 to .00016 broad.

Pileus 2 to 3 in. broad ; stem 1.5 to 2 in. long, sometimes cæspitose.

Pine woods. North Carolina, *Schweinitz, Curtis.* Pennsylvania, *Schweinitz.* New England, *Frost, Palmer, Bennett.*

The shallow tubes, 2 to 3 lines long, are said to resemble the pores of *Merulius lacrymans.* The species is recorded edible by Curtis, Gillet and Palmer.

Boletus rubinellus PK.

REDDISH BOLETUS

Rep. 32, p. 33. Bull. N. Y. S. Mus. 2, p. 15, pl. 2, figs. 20 to 22

Pileus broadly conical or convex, viscid when moist, subtomentose or slightly pubescent when dry, *red fading to yellow on the margin,* flesh whitish or yellowish, taste *mild ;* tubes adnate or slightly depressed around the stem, dingy-reddish, becoming subferruginous ; stem equal, slender, even, colored like the tubes, *yellow within,* sometimes yellow at

the base; spores oblong-fusiform, ferruginous-brown, .0005 to .0006 in. long, .00016 broad.

Pileus 1 to 2 in. broad; stem 1 to 2 in. long, 1 to 3 lines thick.

Mixed woods or under or near coniferous trees in open places. New York, *Peck.*

The original specimens, having been collected in a dry time, were not found viscid and were referred to the Subtomentosi, but later observations show that the pileus is viscid when moist, and the species is therefore transferred to the Viscipelles and placed near *B. piperatus* from which it is easily separated by the colors of the pileus, the mild taste and the longer spores.

Boletus piperatus Bull.

Peppery Boletus

Hym. Eur. p. 500. Syl. Fung. Vol. VI, p. 8, *Boletus Sistotrema* Rep. 23, p. 133

Pileus convex or nearly plane, glabrous, *slightly viscid* when moist, *yellowish, cinnamon* or *subferruginous*, flesh white or yellowish, taste *acrid, peppery;* tubes rather long and large, angular, often unequal, plane or convex, adnate or subdecurrent, *reddish-ferruginous;* stem slender, subequal, tawny-yellow, bright yellow at the base; spores subfusiform, ferruginous-brown, .00035 to .00045 in. long, .00016 broad.

Pileus 1 to 3 in. broad; stem 1.5 to 3 in. long, 2 to 4 lines thick.

Woods and open places. Common and variable. North Carolina, *Schweinitz, Curtis.* Pennsylvania, *Schweinitz.* New York, *Peck.* New England, *Frost, Bennett.* Ohio, *Morgan.* California, *Harkness, Moore.*

This species may easily be recognized by its peppery flavor. The pileus sometimes appears as if slightly tomentose, and both this and the preceding species recede from the character of the tribe by the slight viscidity of the pileus.

This is sometimes rimose-areolate and sometimes the margin is very obtuse by the elongation of the tubes. In the form reported as *B. sistotrema* the mouths of the tubes near the stem are unusually large, unequal and sinuate. The spores of the European plant are described as brown; in our plant they have a ferruginous tint when seen in a mass on white paper.

PULVERULENTI

Pileus clothed with a yellow dust or a yellow pulverulent tomentum. Stem more or less yellow pulverulent, neither bulbous nor distinctly reticulated.

The species which constitute this tribe are easily distinguished from all others by the sulphur-colored pulverulence which coats the pileus and stem like a universal veil. They appear thus far to be peculiar to this country. Though strongly resembling each other in the tribal character they are very diverse in other respects. One species, by its viscidity, connects with the preceding tribe; another by its differently colored tube mouths is related to the Luridi; and the third is peculiar in its ligneous habitat.

Plant growing on the ground 1
Plant growing on wood ..... B. hemichrysus.
1. Tubes adnate, of one color ..... B. Ravenelii.
1. Tubes free, with red mouths ..... B. auriflammeus.

Boletus hemichrysus B. & C.

HALF-GOLDEN BOLETUS

Ann. Mag. Nat. Hist. 1853, p. 13. Grevillea, Vol. I, p. 35

Pileus convex, at length plane or irregularly depressed, floccose-squamulose, covered with a yellow powder, sometimes rimose, bright golden-yellow, flesh thick, *yellow;* tubes adnate or decurrent, yellow, becoming reddish-brown, the mouths large, angular; stem *short, irregular, narrowed below,* sprinkled with a yellow dust, yellowish tinged with red;

mycelium yellow; spores oblong, minute, dingy-ochraceous.

Var. *mutabilis.* Flesh slightly changing to blue where wounded; stem reddish, yellow within, sometimes eccentric; spores oblong-elliptical, .0003 to .00035 in. long, .00012 to .00016 broad.

Pileus 1.5 to 2.5 in. broad; stem about 1 in. long, 3 to 6 lines thick.

Roots of pine, *Pinus palustris.* The variety on stumps of *Pinus strobus.*

South Carolina, *Ravenel.* North Carolina, *Curtis.* New York, *Peck.*

The original description attributes much larger dimensions to this plant than those given here and in Grevillea, the pileus being 6 to 8 in. broad, the stem 1.5 in. thick. The species is remarkable for its habitat, which is lignicolous. The New York variety grew on a stump of white pine. By its eccentric stem it connects this genus with Boletinus, through *Boletinus porosus.* According to the authors of this species it resembles *Boletus variegatus.*

Boletus Ravenelii B. & C.

RAVENEL'S BOLETUS

Ann. Mag. Nat. Hist. 1853, p. 13. Grevillea, Vol. I, p. 35

Pileus convex or nearly plane, *slightly viscid when young or moist,* covered with a sulphur-yellow pulverulent tomentum, becoming naked and dull red on the disk, flesh whitish; tubes at first plane, *adnate,* pale-yellow, becoming yellowish-brown or umber, dingy-greenish where bruised, the mouths large or medium size, subrotund; stem nearly equal, clothed and colored like the young pileus, yellow within, with a slight evanescent webby or tomentose annulus; spores ochraceous-brown, .0004 to .0005 in. long, .0002 to .00025 broad.

Pileus 1 to 3 in. broad; stem 1.5 to 4 in. long, 3 to 6 lines thick.

Woods and copses. South Carolina, *Ravenel.* North Carolina, *Curtis.* New York, *Peck.* New England, *Frost.*

This is a very distinct and very beautiful species. Mr. Ravenel remarks in his notes that "this plant is not infested by larvæ and preserves more constant characters than any other Boletus with which I am acquainted." The webby powdered filaments constitute a universal veil which at first covers the whole plant and conceals the young tubes. As the pileus expands, this generally disappears from the disk, and, separating between the margin and the stem, a part adheres to each. The flesh is sometimes stained with yellow. The tubes in some instances become convex and slightly depressed around the stem. They are almost white when young, and often exhibit brownish hues where wounded. The plant is sometimes cæspitose. I have observed a greenish tint to the freshly shed spores, but it soon disappears. *Boletus subchromeus* Frost Ms. is this species.

Boletus auriflammeus B. & C.

FLAMING-YELLOW BOLETUS

Grevillea, Vol. I, p. 36

Pileus convex, *dry*, pulverulent, bright golden yellow, flesh white, unchangeable; tubes plane or convex, *free*, yellow, their broad angular *mouths scarlet;* stem slightly tapering upward, pulverulent, colored like the pileus; spores .0004 to .0005 in. long, .0002 broad.

Pileus 8 to 12 lines broad; stem 1 to 1.5 in. long.

Woods. North Carolina, *Curtis.* New York, *Peck.*

This is evidently a rare species and as beautiful as it is rare. The whole plant is bright-yellow except the tube mouths, and is sprinkled with yellow dust or minute yellow branny particles. In the New York specimen the scarlet

color is wanting in the marginal tube mouths and the stem is marked with fine subreticulating elevated lines. In other respects it agrees well with the diagnosis of the species. I am informed by Professor Farlow that according to an authentic specimen in the Curtis Herbarium, *Boletus læticolor* B. & C. of Curtis Catalogue is the same as this species.

SUBPRUINOSI

Pileus glabrous, but more often pruinose. Tubes adnate, yellowish. Stem equal, even, neither bulbous nor reticulated.

The species of this tribe have the pileus neither viscid nor distinctly and permanently tomentose. Typically it is glabrous or merely pruinose, but Fries has admitted into the group one species with a pulverulent, and one with a silky pileus. The species are not sharply distinguished from those of the following tribes and possibly some have been admitted here which might as well have been placed there. Some of the species are variable in color and their characters are not sufficiently well known.

	Tubes bright-yellow, golden or subochraceous. ...	1
	Tubes pale or whitish-yellow	6
1.	Tubes changing to blue where wounded.....	2
1.	Tubes not changing to blue.....	3
2.	Stem pallid, with a circumscribing red line at the top.....	B. glabellus.
2.	Stem yellow, sometimes with red stains.....	B. miniato-olivaceus.
2.	Stem red, yellow at the top	B. bicolor.
3.	Stem viscid or glutinous when moist..	B. auriporus.
3.	Stem not viscid.....	4
4.	Plant growing on Scleroderma.....	B. parasiticus.
4.	Plant terrestrial	5
5.	Tubes greenish-yellow	B. alutaceus.
5.	Tubes golden-yellow	B. tenuiculus.
6.	Pileus reticulated with subcutaneous brown lines	B. dictyocephalus.
6.	Pileus not reticulated.....	7
7.	Tubes changing to blue where wounded.....	B. pallidus.

7. Tubes not changing to blue	8
8. Stem uniformly colored	B. subglabripes.
8. Stem yellowish streaked with brown	B. innixus.

Boletus miniato-olivaceus Frost

Olive-red Boletus

Bull. Buff. Soc. 1874, p. 101

Pileus at first convex and firm, then nearly plane, soft and spongy, glabrous, vermilion, becoming olivaceous, flesh pale-yellow, changing to blue where wounded; tubes bright lemon-yellow, adnate or subdecurrent; stem glabrous, enlarged at the top, pale-yellow, brighter within, sometimes lurid at the base; spores .0005 in. long, .00025 broad.

Var. *sensibilis.* (*Boletus sensibilis* Rep. 32, p. 33.)

Pileus at first pruinose-tomentose, red, becoming glabrous and ochraceous-red with age; tubes bright-yellow tinged with green, becoming sordid-yellow; stem lemon-yellow with red or rhubarb stains at the base, contracted at the top when young, subcæspitose; spores .0004 to .0005 in. long, .00016 to .0002 broad.

Pileus 2 to 6 in. broad; stem 3 to 4 in. long, 3 to 6 lines thick.

Woods and their borders. New England, *Frost.* New York, *Peck.*

Though the sensitive Boletus differs considerably in some respects from the olive-red Boletus it is probably only a variety and as such I have subjoined it here. In it, every part of the plant quickly changes to blue where wounded, and even the pressure of the fingers in handling the fresh specimens is sufficient to induce this change of color. The character suggested the name given to the variety. I have not found the typical plant in New York, but specimens received from Mr. Frost are not, in the dry state, distinguishable from the variety. *Boletus subtomentosus,* Palmer's Mushrooms of America, Plate VII, fig. 4, appears to belong to this species.

Boletus bicolor Pk.

Two-colored Boletus

Rep. 24, p. 78, pl. 2, figs. 5 to 8

Pileus convex, glabrous or merely pruinose-tomentose, dark-red, firm, becoming soft, paler and sometimes spotted or stained with yellow when old, flesh yellow, not at all or but slightly and slowly changing to blue where wounded; tubes nearly plane, adnate, bright-yellow, becoming ochraceous, slowly changing to blue where wounded, their mouths small, angular or subrotund; stem subequal, firm, solid, *red, generally yellow at the top;* spores pale, ochraceous-brown, .0004 to .0005 in. long, .00016 to .0002 broad.

Pileus 2 to 4 in. broad; stem 1 to 3 in. long, 4 to 6 lines thick.

Woods and open places. New York, *Peck.* Wisconsin, *Bundy.*

The color of this plant is somewhat variable. In the typical form the pileus and stem are dark red, approaching Indian red, but when old the color of the pileus fades and is often intermingled with yellow. The surface sometimes cracks and becomes rimose-areolate. From the European *B. Barlæ* this species is separated by its solid stem, from *B. versicolor* by its small tube mouths and its red stem.

Boletus glabellus Pk.

Smoothish Boletus

Rep. 41, p. 76

Pileus fleshy, thick, broadly convex or nearly plane, soft, dry, subglabrous, *smoky-buff*, flesh *white*, both it and the tubes changing to blue where wounded; tubes nearly plane, adnate, ochraceous tinged with green, their mouths small, subrotund; stem subequal, glabrous, even, reddish toward

the base, pallid above, with a *narrow reddish circumscribing zone or line at the top;* spores oblong, brownish-ochraceous, tinged with green when fresh, .0004 to .0005 in. long, .00016 broad.

Pileus 3 to 5 in. broad; stem 1 to 3 in. long, 5 to 10 lines thick.

Grassy ground under oaks. New York, *Peck.*

The species is well marked by the reddish band or line on the stem just below the tubes, but this disappears in drying.

Boletus alutaceus Morgan Ms.

Leather-colored Boletus

Pileus pulvinate, glabrous, *alutaceous* with a tinge of red, flesh *white inclining to reddish;* tubes semifree, medium in size, unequal, angular, greenish-yellow; stem nearly equal, striate, reticulate at the apex, colored like the pileus; spores fusiform, brownish-olive, .0005 in. long, .0002 broad.

Pileus 3 in. broad.

Rocky woods of oak and chestnut. Kentucky, *Morgan.*

The general aspect of the figure of this species recalls some of the forms of *Boletus subtomentosus.* The tubes are nearly equal in length to the thickness of the flesh of the pileus.

Boletus tenuiculus Frost

Thin Boletus

Bull. Buff. Soc. 1874, p. 103

Pileus nearly plane, *thin,* lurid-red on a yellow ground, flesh unchangeable; tubes short, adnate, small, *golden-yellow;* stem *slender,* equal, colored like the pileus; spores .0004 in. long, .00025 broad.

Pileus 1 to 2 in. broad; stem 4 to 6 in. long.

Woods. New England, *Frost.*

The thin pileus and long slender stem readily distinguish this species.

Boletus auriporus Pk.

Golden-pore Boletus

Rep. 23, p. 133

Pileus convex or nearly plane, glabrous or merely pruinose-tomentose, grayish-brown, yellowish-brown or reddish-brown, flesh white, unchangeable; tubes plane or slightly depressed around the stem, adnate or subdecurrent, *bright golden-yellow, retaining their color when dried;* stem equal or slightly thickened at the base, *viscid or glutinous when moist,* especially toward the base, colored like or a little paler than the pileus; spores .0003 to .0004 in. long, .00016 to .0002 broad.

Pileus 1 to 3 in. broad; stem 1 to 3 in. long, 2 to 4 lines thick.

Thin woods and shaded banks. New York, *Peck.* New England, *Frost.*

This species is remarkable for the rich yellow color of the tubes, which is retained unchanged in the dried specimens, and for the viscid stem. This character, however, is not noticeable in dry weather and was overlooked in the original specimens.

Boletus glutinipes Frost Ms. is not distinct.

Boletus innixus Frost

Reclining Boletus

Bull. Buff. Soc. 1874, p. 103

Pileus convex or nearly plane, glabrous, yellowish-brown, slightly areolated when old, yellow in the interstices, flesh

white; tubes adnate, lemon-yellow, unchangeable; stem slender, short, much thickened at the base in large specimens, yellowish streaked with brown, brownish within; spores .0004 in. long, .0002 broad.

Grassy woods. New England, *Frost.*

The whole plant often reclines as if for support.

Boletus parasiticus Bull.

Parasitic Boletus

Hym. Eur. p. 505. Syl. Fung. Vol. VI, p. 22

Pileus convex or nearly plane, dry, silky, becoming glabrous, *soon tessellately rimose*, grayish or dingy-yellow; tubes decurrent, medium size, *golden-yellow;* stem equal, rigid, incurved, yellow without and within; spores oblong-fusiform, pale-brown, .0005 to .0006 in. long, .00016 broad.

Pileus 1 to 2 in. broad; stem 1 to 2 in. long, 2 to 4 lines thick.

Parasitic on species of Scleroderma. New York, *Gerard.* New England, *Sprague, Bennett.*

This species is very rare in this country. It is remarkable for its peculiar habitat. By a singular error *Boletus Betula* Schw. was made a synonym of it by Fries.

Boletus dictyocephalus n. sp.

Reticulate Boletus

Pileus convex, glabrous, *reticulate with brown lines beneath the thin separable cuticle*, brownish-orange, darker in the center and there tinged with pink, flesh white, unchangeable; tubes nearly plane, slightly depressed around the stem, grayish-yellow, becoming brown where bruised; stem equal or slightly tapering at the top, solid, rimose, squamulose-

dotted, lemon-yellow, darker toward the base; spores .0006 to .0008 in. long, .00025 broad.

Pileus 2.5 in. broad; stem 3 to 4 in. long, 5 to 6 lines thick.

Mixed woods. North Carolina, *C. J. Curtis.*

The description here given has been derived from a single dried specimen and from the notes kindly sent by Mr. Curtis. The species is apparently well marked and very distinct by the peculiar reticulations of the pileus.

Boletus subglabripes Pk.

Smoothish-stemmed Boletus

Boletus flavipes Pk. Rep. 39, p. 42

Pileus convex or nearly plane, glabrous, reddish inclining to chestnut color, flesh white, unchangeable; tubes nearly plane or convex, adnate, *pale-yellow*, becoming darker or greenish-yellow with age, the mouths small, subrotund; stem equal, solid, *furfuraceous*, pale-yellow; spores oblong-fusiform, .0005 to .0006 in. long, .00016 to .0002 broad.

Var. *corrugis.* Pileus *corrugated or pitted;* stem pale-yellow or pallid, sometimes slightly thickened toward the base.

Pileus 1.5 to 4 in. broad; stem 2 to 3 in. long, 4 to 8 lines thick.

Woods. New York, *Peck.*

The branny particles on the stem are pale and easily overlooked. The color of the stem is generally similar to that of the tubes. The color of the pileus sometimes approaches wood-brown but it has more ochraceous or buff-brown in it. The fresh spores have a slight greenish or olivaceous tint, but when old and dry they have the pale ochraceous-brown hue seen in those of most species of this tribe. It has been necessary to change the name of the species, the one first given being preoccupied.

Boletus pallidus Frost

Pale Boletus

Bull. Buff. Soc. 1874, p. 105

Pileus convex, becoming plane or centrally depressed soft, glabrous, pallid or brownish-white, sometimes tinged with red, flesh white; tubes plane or slightly depressed around the stem, nearly adnate, *very pale or whitish-yellow*, becoming darker with age, *changing to blue where wounded*, the mouths small; stem equal or slightly thickened toward the base, rather long, glabrous, often flexuous, whitish, sometimes streaked with brown, often tinged with red within; spores pale ochraceous-brown, .0004 to .0005 in. long, .0002 to .00025 broad.

Pileus 2 to 4 in. broad; stem 3 to 5 in. long, 4 to 8 lines thick.

Woods. New England, *Frost.* New York, *Peck.*

The species is readily recognized by its dull pale color, rather long stem and tubes changing to blue where wounded.

SUBTOMENTOSI

Pileus when young villose or subtomentose, rarely becoming glabrous with age, destitute of a viscid pellicle. Tubes of one color, adnate. Stem at first extended, neither bulbous nor reticulated with veins, rugose or striated in some species. Flesh in some changing color where wounded.

The tubes are generally yellow or greenish-yellow. In some species they are occasionally somewhat depressed around the stem but they do not form a rounded free stratum, nor, with the exception of *B. rubeus*, are they stuffed when young as in most of the Edules. The species are scarcely separable from those of the preceding tribe except by the more evidently tomentose young pileus.

	Tubes brown, becoming cinnamon	B. variegatus.
	Tubes not having these colors	1
1.	Flesh or tubes changing to blue where wounded	2
1.	Flesh or tubes not changing to blue	5
	2. Stem glabrous	3
	2. Stem not glabrous	4
3.	Flesh yellow under the cuticle	B. rubeus.
3.	Flesh red under the cuticle	B. chrysenteron.
	4. Stem velvety at the base	B. striæpes.
	4. Stem with a reddish bloom or scurf	B. radicans.
	4. Stem with brown dot-like scales	B. mutabilis.
5.	Tubes whitish, becoming yellow	B. Roxanæ.
5.	Tubes yellow	6
	6. Tube mouths large and angular	B. subtomentosus.
	6. Tube mouths minute	B. spadiceus.

Boletus variegatus Swartz

Variegated Boletus

Hym. Eur. p. 501. Syl. Fung. Vol. VI, p. 12. *Boletus reticulatus*, Syn. Fung Car. 862, Consp. Fung. p. 240

Pileus at first convex, then plane, obtuse, moist, sprinkled with *superficial fasciculate-hairy squamules, dark-yellow*, the acute margin at first flocculose, flesh yellow, here and there becoming blue; tubes adnate, unequal, minute, *brown, then cinnamon;* stem firm, equal, even, dark-yellow, sometimes reddish; spores oblong-ellipsoid, hyaline or very pale yellowish, .0003 to .0004 in. long, .00012 to .00016 broad.

Pileus 2 to 5 in. broad; stem 2 to 3 in. long, 6 lines thick.

Woods, especially of pine. North Carolina, *Curtis, Schweinitz.* California, *Harkness, Moore.* Rhode Island, *Bennett.*

In North Carolina the plant is said to occur in sphagnous ground. European authors disagree as to the character of the spores. According to W. G. Smith they are "oval, greenish-ochre," .00012 × .00008.

Boletus Roxanæ Frost

ROXANA'S BOLETUS

Bull. Buff. Soc. 1874, p. 104. *Boletus sulphureus* Rep. 38, p. 90

Pileus broadly convex, at first subtomentose, then fascicu lately red-pilose, *yellowish-brown*, flesh yellowish-white; tubes at first *whitish, then light-yellow*, arcuate-adnate or slightly depressed around the stem, the mouths small; stem enlarged toward the base, striate at the apex, yellowish or pale-cinnamon; spores .0004 in. long, .00016 broad.

Var. *auricolor*. Pileus and subequal stem bright yellow, the tomentum of the pileus yellow.

Pileus 1.5 to 3 in. broad; stem 1 to 2 in. long, 3 to 5 lines thick.

Borders of woods. New England, *Frost*. New York, *Peck*.

In the dried state the variety, which occurs in New York, cannot be distinguished from the typical form. In drying, the margin of the pileus has a tendency to curve upwards. The hairy tufts or squamules are very minute and sometimes appear almost granular. The species seems intermediate between *B. variegatus* and *B. sulphureus*, with the latter of which the variety connects it.

Boletus striæpes Secr.

STRIATE-STEMMED BOLETUS

Hym. Eur. p. 502. Syl. Fung. Vol. VI, p. 13

Pileus convex or plane, soft, silky, *olivaceous, the cuticle ferruginous within*, flesh white, yellow next the tubes, sparingly changing to blue; tubes adnate, greenish, their mouths minute, angular, yellow; stem firm, curved, marked with *brownish-black striatious*, yellow, velvety and brownish-rufescent at the base; spores .0004 to .0005 in. long, .00016 broad.

Pine and oak woods. Minnesota, *Johnson*.

I have seen no specimens of this species which is recorded from but one locality in our country. The character, "flesh sparingly changing to blue" is given on the authority of Rev. M. J. Berkeley.

Boletus chrysenteron Fr.

Golden-flesh Boletus. Red-cracked Boletus

Hym. Eur. p. 502. Syl. Fung. Vol. VI, p. 14

Pileus convex or plane, soft, floccose-squamulose, often rimose areolate, brown or brick-red, flesh *yellow, red beneath the cuticle,* often slightly changing to blue where wounded; tubes subadnate, greenish-yellow, *changing to blue where wounded;* their mouths rather large, angular, unequal; stem subequal, rigid, fibrous-striate, red or pale-yellow; spores fusiform, pale-brown, .00045 to .0005 in. long, .00016 to .0002 broad.

Pileus 1 to 3 in. broad; stem 1 to 3 in. long, 3 to 6 lines thick.

Woods and mossy banks. North Carolina, *Curtis.* New York, *Peck.* New England, *Frost.* Ohio, *Morgan.* Minnesota, *Johnson.* Wisconsin, *Bundy.*

The species is common and very variable. The color of the pileus may be yellowish-brown, reddish-brown, brick-red, tawny or olivaceous. The subcutaneous reddish tint and the reddish chinks of the rimose pileus are distinguishing features. Wounds of the tubes sometimes become blue then greenish. Authors disagree concerning the edible qualities of this Boletus. Stevenson gives it as edible, but Cordier and Gillet say that it is regarded with suspicion. In one strongly marked form the tubes are decidedly depressed around the stem, in another the flesh is whitish tinged with red. It may be doubted whether these are varieties or distinct species.

Boletus rubeus Frost

Red Boletus

Bull. Buff. Soc. 1874, p. 102

Pileus broadly convex, very finely appressed subtomentose, bright brick-red when young, becoming mottled with red and yellow, *yellow under the cuticle*, the thin margin at first inflexed, then horizontal, curved upwards when old, flesh pale-yellow, changing to blue where wounded; tubes adnate or slightly depressed around the stem, lemon-yellow and *stuffed when young*, becoming yellow and sometimes red at the mouths; stem small, often flexuous, colored like the pileus, reddish within, white-tomentose at the base; spores 00035 to .0005 in. long, .00016 to .0002 broad.

Pileus 2 to 4 in. broad; stem 1 to 3 in. long, 3 to 5 lines thick.

Deep woods. Rare. New England, *Frost.*

This is apparently too closely related to *B. chrysenteron*, and it also resembles *B. bicolor*. The red mouths of the tubes are suggestive of the Luridi, but as they occur only in mature plants and are not constant, they are scarcely sufficient to place the species in that tribe. The stuffed mouths of the young tubes connect the species with the Edules but the adnate tubes prevent its association with them.

Boletus subtomentosus L.

Subtomentose Boletus. Yellow-cracked Boletus

Hym. Eur. p. 503. Syl. Fung. Vol. VI, p. 14

Pileus convex or nearly plane, soft, dry, *villose-tomentose, subolivaceous, concolorous beneath the cuticle*, often rimose-areolate, flesh white or pallid; tubes adnate or somewhat depressed around the stem, yellow, their mouths large, angular; stem stout, somewhat ribbed-sulcate, scabrous or

scurfy with minute dots; spores .0004 to .0005 in. long, .00016 to .0002 broad.

Pileus 1 to 4 in. broad; stem 1 to 2.5 in. long, 2 to 5 lines thick.

Woods. North Carolina, *Schweinitz, Curtis.* Pennsylvania, *Schweinitz.* New York, *Peck.* New England, *Frost, Palmer.* Ohio, *Lea, Morgan.* Wisconsin, *Bundy.* Minnesota, *Johnson.* California, *Harkness, Moore.* Kansas, *Cragin.* New Jersey, *Ellis.*

Common and variable. The pileus is usually olivaceous or yellowish-brown, but it may be reddish-brown or tawny-red. When it cracks the chinks become yellow. The stem is often attenuated downwards, but it is not always ribbed or sulcate. In one form it is marked with slight anastomosing lines which form broad reticulations as in *B. lanatus* Rost. In another form which grows on much decayed wood or stumps the pileus is dark-brown. These may be distinct species. According to Johnson, wounds of the flesh sometimes become reddish, and according to Palmer, the "flesh tubes and stem change to blue wherever bruised or cut," but I have not been able to verify these statements. The species as I understand it, may be distinguished from its near relative, *B. chrysenteron*, by its paler flesh, the clearer yellow tubes not changing to blue where wounded, and by the chinks of the pileus becoming yellow. The spores of the European plant have been described as yellowish-brown and as hyaline or very pale-yellow. Those of the American plant, when shed on white paper, appear to me to be ochraceous-brown. The species is recorded edible by Cordier, Curtis and Palmer. Gillet says it is only medium in quality.

Boletus spadiceus Schæff.

Date-brown Boletus

Hym. Eur. p. 503. Syl. Fung. Vol. VI, p. 15

Pileus convex or plane, moderately compact, dry, tomentose, opaque, *date-brown*, irregularly cracked, flesh white, unchangeable, brownish-red above; tubes adnate, yellow, their mouths minute, subrotund; stem firm, clavate, even, *flocculose-furfuraceous*, yellow or brownish, yellowish-white within; spores .00045 in. long, .00016 broad.

Pileus 2 to 4 in. broad.

Woods. New England, *Frost.*

This species is admitted on the authority of Mr. Frost who alone has recorded it in this country. But specimens received from him under this name do not in my opinion belong to it, and its occurrence here is somewhat doubtful.

Boletus radicans Pers.

Radicant Boletus

Hym. Eur. p. 503. Myc. Eur. Vol. 2, p. 134. Syl. Fung. Vol. VI, p. 16. Jour. Cin. Soc. Nat. Hist. Vol. VII, p. 6

Pileus convex, dry, subtomentose, olivaceous-cinereus, becoming pale-yellowish, the margin thin, involute, flesh pale-yellow, instantly changing to dark blue, taste bitterish; tubes adnate, their mouths large, unequal, lemon-yellow; stem even, *tapering downwards and radicating*, *flocculose with a reddish bloom*, pale-yellow, becoming naked and dark with a touch.

Pileus 2 to 3 in. broad; stem 2 in. long, 6 lines thick.

Woods. Ohio, *Morgan.*

Of the American plant Mr. Morgan says, that the pileus is quite firm and dry, becomes reddish or brownish-yellow

and nearly glabrous, that the flesh is pale-yellow but that he has not observed any bluish tinge, and that the spores are olive, fusiform, .0004 to .0005 in. long, .0002 broad. Those of the European plant have been described as very pale ochre, almost white, .00024 in. long, .00012 broad.

Boletus mutabilis Morg.

Changeable Boletus

Jour. Cin. Soc. Nat. Sci. Vol. VII, p. 6, tab. 1

Pileus convex, then plane or depressed, compact, dry, subtomentose, *brown*, flesh bright-yellow, *promptly changing to blue where wounded;* tubes adnate or subdecurrent, their mouths large, angular, unequal, some of them compound, yellow changing to greenish-yellow and *quickly becoming blue where wounded;* stem stout, solid, flexuous, subsulcate, yellowish beneath the *brown punctate scales*, bright-yellow within; spores olive, fusiform, .00045 to .0005 in. long, .0002 broad.

Pileus 2.5 to 4 in. broad; stem 2 to 3 in. long, 6 lines thick.

Thick woods. Ohio, *Morgan.*

A shade of yellow sometimes appears beneath the brown of the pileus, and as the plants grow old the pileus becomes blackish, glabrous and shining. The stem increases in thickness above and downward.

LACERIPEDES

Stem elongated, coarsely pitted or deeply and lacunosely reticulated, the ridges somewhat intumescent in wet weather and more or less lacerated, giving a rough or shaggy appearance to the stem.

The species of this tribe are few, very closely allied and so far as known are peculiar to this country.

Pileus viscid	1
Pileus dry	B. Russellii.
1. Stem red in the depressions, tubes tinged with green	B. Morgani.
1. Stem pale-yellow, tubes not greenish	B. Betula.

Boletus Russelli Frost

Russell's Boletus

Bull. Buff. Soc. 1874, p. 104

Pileus thick, hemispherical or convex, *dry*, *tomentose-squamulose or fasciculately red-pilose*, yellowish beneath the tomentum, often rimose-areolate, flesh yellowish, unchangeable; tubes subadnate, often depressed around the stem, rather large, dingy-yellow or yellowish-green; stem very long, equal or tapering upwards, roughened by the lacerated margins of the reticular depressions, *red or brownish-red;* spores olive-brown, .0007 to .0009 in. long, .0003 to .0004 broad.

Pileus 1.5 to 4 in. broad; stem 3 to 7 in. long, 3 to 6 lines thick.

Woods and open places. New England, *Frost.* New York, *Peck.* North Carolina, *C. J. Curtis.* New Jersey, *Ellis.*

This is distinguished from the other species by the dry squamulose pileus and the color of the stem. The latter is sometimes curved at the base.

Boletus Morgani Pk.

Morgan's Boletus

Bull. Torr. Bot. Club, Vol. X, p. 73, tab. 35

Pileus convex, soft, *glabrous*, *viscid*, red or yellow, or red fading to yellow on the margin, flesh whitish tinged with red and yellow, unchangeable; tubes convex, depressed around the stem, rather long and large, bright-yellow becoming greenish-yellow; stem elongated, tapering upward,

pitted with long, narrow depressions, *yellow, red in the depressions,* colored within like the flesh of the pileus; spores olive-brown, .0007 to .0009 in. long, about half as broad.

Pileus 1.5 to 2.5 in. broad; stem 3 to 5 in. long, 3 to 6 lines thick.

Rocky hillsides in woods of deciduous trees. Kentucky, *Morgan.*

In wet weather the anastomosing ridges of the stem swell and become broadly winged, thereby giving the stem a peculiar lacerated appearance. The glabrous viscid pileus and the coloration of the stem distinguish the species.

Boletus Betula Schw.

Birch Boletus

Syn. Fung. Car. 86o

Pileus convex, viscose and shining in wet weather, tessellately rimose and reticulated, orange fawn color, rather small, flesh yellowish-white; tubes separating, rather large, *yellow,* almost like those of *B. subtomentosus* but *not greenish;* stem long, *attenuated downward,* everywhere covered with a deciduous reticulated bark two lines high and separating like the bark of birches, *pale-yellow without and within.*

Pileus 1.5 in. broad; stem 5 to 6 in. long.

Ligneous earth. North Carolina, *Schweinitz, Curtis.* Pennsylvania, *Schweinitz.*

According to the description, this species differs from *B. Morgani* in its tessellately rimose pileus, in the absence of greenish hues from the tubes and in its stem which is narrowed downward and of a uniform pale-yellow color. It is not impossible that Schweinitz included both the preceding in his species, inasmuch as he says it was "frequent;" and

there is some reason for supposing that all are forms of a single polymorphous species. The peculiar character and the great similarity in the stem of all of them are at least suggestive of a common origin if not of a unity of species. A better knowledge of these forms may perhaps lead to their union, but for the present it seems best to keep them distinct.

CALOPODES

Stem stout, at first bulbous, typically venose-reticulated. Tubes adnate, their mouths not reddish.

The reticulate stem and adnate tubes of one color distinguish the species of this tribe. In the Luridi the mouths of the tubes are differently colored and in the closely related Edules the tubes are more or less depressed around the stem or subfree, and their pores are commonly stuffed when young. Fries did not admit species with whitish tubes into this tribe, but we have done so in those cases in which this was the only character to exclude them.

	Tubes yellow or yellowish	1
	Tubes white or whitish, at least when young	7
1.	Tubes or flesh changing to blue where wounded	2
1.	Tubes or flesh not changing to blue where wounded	5
	2. Pileus red, at least when young	3
	2. Pileus some other color	4
3.	Stem red	B. Peckii.
3.	Stem yellow or reddish only at the base	B. speciosus.
	4. Tubes angular, pileus olivaceous	B. calopus.
	4. Tubes rotund, pileus not olivaceous	B. pachypus.
5.	Pileus viscid	B. Curtisii.
5.	Pileus pulverulent, stems cæspitose	B. retipes.
5.	Pileus neither viscid nor pulverulent	6
	6. Stem yellow	B. ornatipes.
	6. Stem brown	B. modestus.
	6. Stem yellowish-white	B. rimosellus.
7.	Pileus some shade of red	8
7.	Pileus some shade of brown or gray	9
	8. Stem pallid or yellowish	B. rubiginosus.
	8. Stem dark brown	B. ferrugineus.
9.	Pileus pale-brown, stem flexuous	B. flexuosipes.
9.	Pileus gray or grayish-black, stem straight	B. griseus.

Boletus speciosus Frost

Handsome Boletus

Bull. Buff. Soc., 1874, p. 101

Pileus at first very thick, subglobose, compact, then softer, convex, glabrous or nearly so, red, flesh pale-yellow or bright lemon-yellow, changing to blue where wounded; tubes adnate, small, subrotund, plane or but slightly depressed around the stem, bright lemon-yellow, becoming dingy-yellow with age, changing to blue where wounded; stem stout, subequal or somewhat bulbous, reticulated, *bright lemon-yellow without and within*, sometimes reddish at the base; spores oblong-fusiform, pale ochraceous-brown, .0004 to .0005 in. long, .00016 to .0002 broad.

Pileus 3 to 7 in. broad; stem 2 to 4 in. long, 10 to 24 lines thick.

Thin woods. New England, *Frost.* New York, *Peck.*

This is a very beautiful Boletus. When young, the whole plant except the surface of the pileus is of a vivid lemon-yellow color. Wounds quickly change to green, then to blue. The color of the pileus approaches closely to solferino.

Boletus Peckii Frost

Peck's Boletus

Rep. 29, p. 45

Pileus convex, firm, dry, subglabrous, *red, fading to yellowish-red or buff-brown* with age, the margin usually retaining its red color longer than the disk; tubes adnate or slightly decurrent, nearly plane, yellow, changing to blue where wounded; stem equal or subventricose, reticulated, *red, yellow at the top;* spores oblong, pale ochraceous-brown, .00035 to .00045 in. long, .00016 to .0002 broad.

Var. *lævipes*. Stem reticulated above, even below.

Pileus 2 to 3 in. broad; stem 2 to 3 in. long, 3 to 6 lines thick.

Woods of frondose trees. New York, *Peck*.

The stem is generally more highly colored than the pileus and retains its color better. The species is allied to *Boletus calopus* Fr., from which it is separated by its red expallent pileus, its stem yellow at the top and by its longer spores.

Boletus calopus Fr.

Beautiful-stemmed Boletus

Hym. Eur. p. 506. Syl. Fung. Vol. VI, p. 24

Pileus globose, then convex, unpolished, *subtomentose, olivaceous*, flesh pallid, slightly changing to blue when wounded; tubes adnate, their mouths minute, angular, yellow; stem firm, conical, then elongated and subequal, reticulated, *wholly scarlet or at the apex only*, sometimes colored like the pileus toward the base; spores fusiform, yellowish-brown, .00028 to .00032 in. long, .00012 to .00016 broad.

Pileus 2 to 3 in. broad; stem longer than the diameter of the pileus.

Woods. North Carolina, *Schweinitz, Curtis*. Pennsylvania, *Schweinitz*. New England, *Sprague, Bennett*.

Boletus ornatipes Pk.

Ornate-stemmed Boletus

Rep. 29, p. 67. *Boletus retipes*, Rep. 23, p. 132

Pileus convex, firm, dry, glabrous or very minutely tomentose, *grayish-brown or yellowish-brown*, flesh yellow or pale-yellow; tubes adnate, plane or concave, rarely convex, the mouths small or medium size, clear-yellow; stem firm, subequal, distinctly and beautifully reticulated, yellow with-

out and within; spores oblong, *ochraceous-brown*, .00045 to .00055 in. long, .00016 to .0002 broad.

Pileus 2 to 5 in. broad; stem 2 to 4 in. long, 4 to 6 lines thick.

Thin woods and open places. New York, *Peck*.

The color of the tubes becomes darker with age, but it does not change to blue where wounded. The species is related to the next following one with which it has sometimes been confused, but from which it is clearly distinct. The color of the spores is quite dark and approaches snuff-brown.

Boletus retipes B. & C.

RETICULATE-STEMMED BOLETUS

Grevillea, Vol. I, p. 36

Pileus convex, dry, *powdered with yellow*, sometimes rivulose or rimose-areolate; tubes adnate, yellow; stem subequal, *cæspitose*, reticulate to the base, *pulverulent below;* spores *greenish-ochraceous*, .00045 to .0006 in. long, .00016 to .0002 broad.

Pileus 1.5 to 2 in. broad; stem 2 in. long, 3 to 6 lines thick.

Grassy woods. North Carolina, *Curtis*. Ohio, *Morgan*. Wisconsin, *Bundy*. New England, *Frost*.

The tufted mode of growth, pulverulent pileus and paler colored spores separate this species from the preceding one.

Boletus pachypus FR.

THICK-STEMMED BOLETUS

Hym. Eur. p. 506. Syl. Fung. Vol. VI, p. 34

Pileus convex, subtomentose, brownish or pale tan color, flesh thick, whitish, changing slightly to blue; tubes rather

long, *somewhat depressed around the stem*, their mouths round, pale-yellow, at length tinged with green; stem thick, firm, reticulated, at first ovate-bulbous, then elongated, equal, *variegated with red and pale-yellow;* spores large, *ovate*, pale yellowish-ochraceous, .0005 to .00055 in. long, .0002 to .00024 broad.

Pileus 4 to 8 in. broad; stem 2 to 4 in. long.

Woods, either of pine or beech. North Carolina, *Curtis.* Minnesota, *Johnson.*

This species is noted for its thick, stout stem, which sometimes attains a diameter of more than two inches. It approaches the Edules in habit, but according to Gillet it is poisonous or at least to be suspected, has a penetrating unpleasant odor and a somewhat nauseous flavor. He also describes the pores as at first whitish. The stem is sometimes intensely blood-red.

Boletus rimosellus N. SP.

CHINKY BOLETUS

Pileus broadly convex, flat or irregular, glabrous, *tessellately rimose*, dark-brown, flesh whitish; tubes adnate or sinuately decurrent, somewhat depressed around the stem, pale-yellow, becoming *darker or brownish* with age; stem tapering upward, broadly reticulated with brown veins, *yellowish-white;* spores *fusiform*, .0006 to .0007 in. long, .0002 to .00025 broad.

Pileus 3 to 5 in. broad; stem 3 to 4 in. long, 6 to 9 lines thick.

Mixed woods. North Carolina, *C. J. Curtis.*

I have described this species from the notes and a single dried specimen sent me by Mr. Curtis. More extended observation may require some modification of the description. The color of the spores is described as brown. They are remarkable for their size.

Boletus modestus Pk.

MODEST BOLETUS

Rep. 25, p. 87

Pileus convex or nearly plane, often irregular, firm, dry, very minutely tomentose, *yellowish-brown*, flesh gray or pinkish-gray; tubes nearly plane, adnate or subdecurrent, the mouths angular, pale-ochraceous; stem equal, reticulated, brown; spores elliptical, .0004 in. long, .0002 broad.

Pileus 2 to 3 in. broad; stem 1 to 2 in. long, 2 to 4 lines thick.

Grassy ground in thin woods. New York, *Peck*.

Miss Banning finds, in Maryland, what appears to be a form of this species in which the part of the hymenium near the stem consists of lamellæ, the rest of tubes. The species needs further investigation.

Boletus Curtisii Berk.

CURTIS' BOLETUS

Ann. Mag. Nat. Hist. 1853, p. 13. Grevillea, Vol. I, p. 35

Pileus hemispherical or convex, *viscose, golden-yellow;* tubes depressed around the stem, nearly free, their mouths umber, at length tawny; stem slender, attenuated upward, polished, reticulated, straw-colored; spores ferruginous, subelliptical, slightly attenuated at each end.

Pileus 1 in. or more broad; stem 2 in. long, 2 to 3 lines thick.

Pine woods. North and South Carolina, *Curtis*.

In the original description the stem of this species is said to be hollow. The viscose pellicle indicates a relationship to the Viscipelles, with which the reticulated stem does not harmonize. The nearly free tubes point toward the Edules

against which the slender stem and unstuffed tubes militate. It is also incongruous among the Calopodes but as there seems to be no better place for it, we place it here for the present.

Boletus griseus Frost

Gray Boletus

Rep. 29, p. 45

Pileus broadly convex, firm, dry, subglabrous, *gray or grayish-black*, flesh whitish or gray; tubes adnate or slightly depressed around the stem, nearly plane, their mouths small, subrotund, *white or whitish;* stem equal or slightly tapering upward, distinctly reticulated, *whitish or yellowish*, sometimes reddish toward the base; spores ochraceous-brown, .0004 to .00055 in. long, .00016 to .0002 broad.

Pileus 2 to 4 in. broad; stem 2 to 4 in. long, 3 to 6 lines thick.

Thin woods and open places. New York, *Peck.*

According to the Friesian arrangement, this species should be excluded from this tribe on account of the whitish color of the tubes; and yet it is so closely related to *Boletus ornatipes*, that it scarcely differs in any respect except in color, and it might easily be considered a mere variety of that species. Such instances of close relationship have led me to disregard the division of the genus into series based on the color of the tubes. In this species the reticulations toward the base of the stem are sometimes much coarser and more conspicuous in the fresh plant than those above are, but in the dried plant the upper and finer ones are more distinct than the basal ones. This shows that the lower veins are somewhat intumescent when moist, as in the Laceripedes.

Boletus flexuosipes N. SP.

FLEXUOUS-STEMMED BOLETUS

Pileus convex or plane, even, subtomentose, *pale-brown*, flesh white, unchangeable, the cuticle separable; tubes long, convex, *decurrent*, white or whitish, becoming brownish with age; stem *flexuous*, solid, reticulated, whitish or pallid, *changing to brown where bruised*, spores, .0003 to .0004 in. long, .00016 broad.

Pileus 3 to 4 in. broad; stem 4 to 6 in. long, 8 to 15 lines thick.

Mixed woods. North Carolina, *C. J. Curtis.*

Boletus ferrugineus FROST

FERRUGINOUS BOLETUS

Bull. Buff. Soc. 1874, p. 104

Pileus convex, soft, subtomentose, *dark reddish-brown*, flesh white, unchangeable; tubes generally adnate, dingy-white, their mouths stained brown by the spores; stem short, reticulated, *dark-brown;* spores .0004 to .0005 in. long, .00025 broad.

Pileus 3 to 6 in. broad.

Borders of woods. New England, *Frost.*

Boletus rubiginosus FR.

RUSTY BOLETUS

Hym. Eur. p. 521

Pileus convex, soft, pubescent, soon glabrate, *brownish rust color*, flesh subspongy, white, unchangeable; tubes *adnate*, their mouths unequal, white; stem firm, stout, reticulated, at first *whitish or pallid*, then *yellowish*, subcinereous or yellowish-olivaceous where touched.

Pileus 2 to 4 in. broad; stem 2 to 3 in. long, 1 in. thick. Woods. North Carolina, *Curtis*.

Although apparently distinct, this and the two preceding species are not sufficiently well known.

EDULES

Tubes subfree, rounded-depressed around the stem, their mouths not at first reddish, but commonly white-stuffed. Stem stout, bulbous as in the Luridi, but not, with a few exceptions, reticulate nor punctate-squamulose nor red. Flesh scarcely changeable. Taste pleasant.

This tribe is not sharply limited but partakes to some extent of the characters of Calopodes and Luridi. From the former, its nearly free and at first white-stuffed tubes and its generally even stem separate it, from the latter its tubes with concolorous mouths or at least with mouths not red or reddish when young will distinguish it. The species are generally of large or medium size and noted for their esculent qualities.

Stem brownish-lilac or chocolate color	1
Stem some other color	2
1. Stem reticulated	B. separans.
1. Stem not reticulated, furfuraceous	B. eximius.
2. Pileus viscid	B. limatulus.
2. Pileus not viscid	3
3. Tubes yellow with no tinge of green	4
3. Tubes tinged with green or becoming green where bruised	6
4. Pileus whitish	B. æstivalis.
4. Pileus not whitish	5
5. Stem glabrous	B. affinis.
5. Stem pubescent	B. impolitus.
6. Pileus becoming white-spotted where bruised	B. leprosus.
6. Pileus not becoming spotted	7
7. Pileus glabrous	B. edulis.
7. Pileus not glabrous	8
8. Stem reticulated, whitish or pallid	B. variipes.
8. Stem even, brownish-red	B. decorus.

Boletus separans Pk.

Separating Boletus

Rep. 25, p. 81

Pileus convex, thick, glabrous, subshining, often pitted, lacunose or corrugated, brownish-red or dull-lilac, sometimes fading to yellowish on the margin, flesh white, unchangeable; tubes at first nearly plane, adnate, white and stuffed, then convex, depressed around the stem, ochraceous-yellow or brownish-yellow and sometimes separating from the stem by the expansion of the pileus; stem equal or slightly tapering upward, reticulated either wholly or in the upper part only, colored like the pileus or a little paler, sometimes slightly furfuraceous; spores subfusiform, brownish-ochraceous, .0005 to .0006 in. long, .0002 to .00025 broad.

Pileus 3 to 6 in. broad; stem 2 to 4 in. long, 6 to 12 lines thick.

Thin grassy woods. New York, *Peck.*

This large and fine species might, with almost equal propriety, be placed among the Calopodes on account of the adnate tubes and reticulate stem, but the young tubes, being white-stuffed, lead me to place it here. Freshly dried or drying specimens often emit a strong subacid odor.

Boletus edulis Bull.

Edible Boletus

Hym. Eur. p. 508. Syl. Fung. Vol. VI, p. 29

Pileus convex or nearly plane, *glabrous,* moist, at first compact, then soft, variable in color, grayish-red, brownish-red or tawny-brown, often paler on the margin, flesh white or yellowish, reddish beneath the cuticle; tubes convex, nearly free, long, minute, round, *white, then yellow and greenish;* stem short or long, straight or flexuous, subequal or

bulbous, stout, more or less reticulate, especially above, whitish, pallid or brownish; spores oblong-fusiform, .0005 to .0006 in. long, .00016 to .0002 broad.

Var. *clavipes*. Stem tapering upward from an enlarged base, everywhere reticulated.

Pileus 4 to 6 in. broad; stem 2 to 6 in. long, 6 to 18 lines thick.

Woods and open places. Not rare. North Carolina, *Schweinitz, Curtis*. Pennsylvania, *Schweinitz*. New York, *Peck*. New England, *Frost, Palmer, Bennett*. Ohio, *Morgan*. Minnesota, *Johnson*. Wisconsin, *Bundy*. California, *Harkness, Moore*. New Jersey, *Ellis*.

The species is very variable in size, color, and character of the stem. All authors agree in pronouncing it edible. Badham recommends only this Boletus and *Boletus scaber* for food, but says he has eaten small quantities of *Boletus flavus* and *B. granulatus*, which have a flavor similar to that of *B. edulis*. Gillet says that it is an excellent species with an agreeable flavor and that it is eaten in large quantities in central France; also that it is dried and thus preserved and sold as an article of trade. The variety scarcely differs from var. *pachypus* R. & R., except in being reticulated to the base.

Boletus variipes Pk.

Variable-stemmed Boletus

Rep. 41, p. 76

Pileus convex or nearly plane, thick, soft, dry, *squamulose punctate-squamulose or minutely tomentose*, grayish or pale grayish-brown, sometimes tinged with yellow or ochraceous, flesh white, unchangeable; tubes convex or nearly plane, slightly depressed around the stem, at first white, then greenish-yellow, their mouths small, subrotund, *ochraceous*, stuffed when young; stem firm, reticulated, whitish or pal-

lid; spores oblong-fusiform, ochraceous-brown tinged with green, .0005 to .0006 in. long, .0002 broad.

Var. *albipes.* Stem whitish, wholly reticulated, the reticulations coarser near the base.

Var. *pallidipes.* Stem pallid, slightly furfuraceous, even or obscurely reticulated toward the base, distinctly reticulated above.

Var. *tenuipes.* Stem slender, elongated.

This species is closely related to *B. edulis*, from which it is easily separated by its squamulose-tomentose pileus and less free tubes. It is very variable in the character of the stem. In drying, the pileus often becomes yellowish. The ochraceous tube mouths indicate an approach to the Luridi.

Boletus eximius Pk.

SELECT BOLETUS

Jour. Myc. Vol. 3, p. 54. *Boletus robustus* Frost. Bull. Buff. Soc. 1874, p. 104

Pileus at first very compact, subglobose or hemispherical, subpruinose, *purplish-brown or chocolate-color*, sometimes with a faint tinge of lilac, becoming convex, soft, smoky-red or pale-chestnut, flesh grayish or reddish-white; tubes at first concave or nearly plane, stuffed, colored nearly like the pileus, becoming paler with age and depressed around the stem, their mouths minute, rotund; stem stout, generally short, equal or tapering upward, abruptly narrowed at the base, *minutely furfuraceous*, colored like or a little paler than the pileus, purplish-gray within; spores subferruginous, .00045 to .0006 in. long, .0002 to .00025 broad.

Pileus 3 to 10 in. broad; stem 2 to 4 in. long, 6 to 12 lines thick.

Woods and their borders. New England, *Frost.* New York, *Peck.*

This large and noble Boletus is quite constant in its characters and easily recognized. *Boletus robustus* Fr., an in-

habitant of Costa Rica, differs in its whitish, subbulbous or obclavate stem and its entirely free tubes.

Boletus leprosus N. SP.

LEPROUS BOLETUS

Pileus very convex, glabrous, soft like kid, cinereous yellowish-drab or pale-brown, *slowly changing to whitish where bruised*, the cuticle separable, flesh *white, changing to yellowish;* tubes yellow or brownish-yellow, *changing to greenish where wounded*, plane, depressed around the stem, short, small, stuffed when young; stem solid, enlarged at the top, *lemon-yellow;* spores oblong-fusiform, .0005 to .0006 in. long, .0002 broad.

Pileus 4 to 6 in. broad; stem 2 in. long, 1 in. thick.

Mixed woods. North Carolina, *C. J. Curtis.*

This plant is remarkable for the whitish or leprous spots which the pileus assumes, even from being handled, and for the change in the color of the flesh and tubes. The stem is very thick at the top but tapers downward.

Boletus affinis PK.

RELATED BOLETUS

Rep. 25, p. 81

Pileus convex or nearly plane, dry, glabrous or minutely tomentose, even or slightly rugose, brown or chestnut color, fading to tawny or ochraceous with age, sometimes rimose-areolate or spotted, flesh white, occasionally slowly changing to yellowish where wounded; tubes plane or convex, *adnate or slightly depressed* around the stem, at first white and stuffed, then glaucous-yellow or subochraceous, becoming *ferruginous-ochraceous where wounded;* stem subequal, sometimes narrowed either above or below, even or rarely

slightly reticulated at the top, glabrous, colored like or paler than the pileus, sometimes tinged with red; spores bright *ferruginous-ochraceous*, .00035 to .0005 in. long, .00016 to .0002 broad.

Var. *maculosus*. Pileus adorned with a few small irregularly scattered yellowish spots.

Pileus 2 to 4 in. broad; stem 1.5 to 3 in. long, 4 to 8 lines thick.

Thin woods. New York, *Peck*. New England, *Frost*.

A variable species receding somewhat from the character of the tribe by its adnate tubes and scarcely bulbous stem. It is separated from the Calopodes by its even stem and stuffed tubes. In wet weather the margin of the pileus sometimes curves upward and then the stratum of tubes becomes very convex. The change of color in the wounded tubes and flesh is peculiar but it does not appear to be constant. The bright rich color of the spores is unusual and is suggestive of a mixture of ferruginous and Indian yellow. *Boletus flavoaureus* Frost's manuscript is this species.

Boletus æstivalis Fr.

Summer Boletus

Hym. Eur. p. 510. Syl. Fung. Vol. VI, p. 31

Pileus convex or nearly plane, even, *glabrous*, *whitish*, granulose in dry weather, flesh yellow below, white above; tubes nearly free, the mouths minute, equal, yellow; stem very thick, bulbous, even, *glabrous*, *pale-yellow*, reddish within at the base; spores elongated-oval, greenish-brown, rather dark, .00045 in. long, .00016 to .0002 broad.

Pileus 4 to 6 in. broad; stem 4 to 5 in. long.

Woods and woodland pastures. Minnesota, *Johnson*. California, *Harkness*, *Moore*.

A large species, recorded as edible and said to be pleasant and delicate in flavor. I have seen no specimens of this nor of the three following species.

Boletus impolitus Fr.

UNPOLISHED BOLETUS

Hym. Eur. p. 509. Syl. Fung. Vol. VI, p. 30

Pileus convex, dilated, *flocculose*, at length granulose-rivulose, unpolished, *tawny-brown*, flesh white or whitish, unchangeable, yellowish under the cuticle; tubes free, their mouths minute, yellow; stem stout, subbulbous, even, *pubescent*, *pale-yellow*, sometimes with a reddish zone near the top; spores oval or fusiform, pale greenish-brown, .0003 to .0004 in. long, .0002 broad.

Pileus 4 to 6 in. broad; stem 2 in. long.

Oak woods. California, *Harkness*, *Moore*.

This species is recorded as edible and said to be among the most delicious. It is evidently rare in this country. According to Quelet the spores are ellipsoid, papillate .0006 to .0007 in. long.

Boletus decorus Frost

DECORUS BOLETUS

Bull. Buff. Soc. 1874, p. 103

Pileus convex, rather firm, tomentose, brownish tinged with red, the margin often darker colored, flesh white, unchangeable; tubes becoming free, yellow, *changing to green where wounded;* stem bulbous, minutely furfuraceous, *brownish-red*, the bulb sometimes white and attenuated at the base; spores .0005 in. long, .0002 broad.

Rich woods. New England, *Frost*.

Boletus limatulus Frost

Polished Boletus

Bull. Buff. Soc. 1874, p. 104

Pileus nearly flat, thin, glabrous, *viscid when moist*, somewhat polished and shining when dry, rich yellowish-brown, flesh *reddish in the pileus*, darker in the stem; tubes depressed around the stem, greenish-yellow, their mouths yellowish-brown; stem small, subbulbous, colored like the pileus; spores .0005 to .0006 in. long, .00016 to .0002 broad.

Pileus 1 to 2.5 in. broad.

Woods. New England, *Frost.*

By the differently colored tube mouths, this species approaches those of the next following tribe, but it is placed here because these are not red or reddish.

LURIDI

Stratum of tubes rounded toward the stem and free, their mouths at first closed and red. Pileus compact, then soft, pulvinate, the flesh juicy, changeable. Stem stout, at first short, bulbiform, then elongated and subequal, subreticulated or dotted.

Growing especially in frondose woods. Very poisonous.

In this tribe the tubes and their mouths are differently colored, the latter being red or some shade of red. By this character the species are easily distinguished from those of other tribes.

Flesh distinctly changing color where wounded	1
Flesh not at all or scarcely changing color where wounded	7
1. Flesh white or whitish	2
1. Flesh yellow or yellowish	5
2. Flesh changing to red or violet	B. Satanus.
2. Flesh changing to blue	3
3. Stem roughened	B. alveolatus.
3. Stem even	4

4. Stem hairy at the base ..... B. subvelutipes.
4. Stem not hairy at the base ..... B. vermiculosus.
5. Stem red ..... B. luridus.
5. Stem yellow or reddish only at the base 6
6. Pileus purplish-red ..... B. purpureus.
6. Pileus gray ..... B. firmus.
6. Pileus yellow or yellowish ..... B. magnisporus.
7. Pileus blood-red ..... B. Frostii.
7. Pileus reddish-tawny or brown ..... B. Sullivantii.

Boletus Satanus Lenz.

Satanic Boletus

Hym. Eur. p. 510. Syl. Fung. Vol. VI, p. 34

Pileus convex, *glabrous*, somewhat viscose, *brownish-alutaceous or whitish*, flesh whitish, becoming *reddish or violaceous* where wounded; tubes free, yellow, their mouths bright red, becoming orange colored with age; stem thick, ovate-ventricose, marked above with red reticulations, spores .00048 in. long, .0002 broad.

Pileus 3 to 8 in. broad; stem 2 to 3 in. long.

Woods. Rare. North Carolina, *Curtis.* New York, *Peck.* California, *Harkness, Moore.*

Though mild to the taste, this Boletus is said to be very poisonous, a character suggestive of the specific name. Fries describes the color of the spores as earthy-yellow; Smith, as rich-brown.

Boletus alveolatus B. & C.

Alveolate Boletus

Bull. Buff. Soc. 1874, p. 102

Pileus convex, glabrous, shining, bright crimson or maroon color, sometimes paler and varied with patches of yellow, flesh firm, white, changing to blue where wounded; tubes *adnate, subdecurrent*, yellow with maroon colored mouths,

the hymenial surface *uneven with irregular alveolar depressions;* stem very *rough with the margins of rather coarse subreticular depressions*, the reticulations bright red above with yellow stains; spores yellowish-brown, .0005 to .0006 in. long, .00016 to .0002 broad.

Pileus 3 to 6 in. broad; stem 3 to 4 in. long, 9 lines thick.

Damp woods. New England, *Frost.*

In Grevillea, vol. I, p. 36, the specimens collected by Sprague and originally named *Boletus alveolatus* B. & C. are said to belong to *B. edulis* or a very nearly allied species. They were not, therefore, published under the name given.

It is presumable that the plant described and published by Mr. Frost was regarded by him as the same thing. But the bright color of the pileus, the adnate tubes with maroon colored mouths, the roughened stem and yellowish-brown spores all indicate a species distinct from *B. edulis.* I have seen no specimens, but have admitted the species as described by Mr. Frost.

Boletus luridus Schæff.

Lurid Boletus

Hym. Eur. p. 511. Syl. Fung. Vol. VI, p. 34

Pileus convex, tomentose, *brown-olivaceous*, then *somewhat viscose*, fuliginose, flesh yellow, changing to blue where wounded; tubes free, yellow, becoming greenish, their mouths round, vermilion, *becoming orange;* stem stout, vermilion, somewhat orange at the top, *reticulate or punctate;* spores greenish-gray, .0006 in. long, .00035 broad.

Pileus 2 to 4 in. broad; stem 2 to 3 in. long.

Woods. North Carolina, *Schweinitz, Curtis.* Pennsylvania, *Schweinitz.* New England, *Frost, Bennett.* California, *Harkness, Moore.*

The lurid Boletus, though pleasant to the taste, is reputed very poisonous. *Boletus rubeolarius* Pers., having a short

bulbous scarcely reticulated stem, is regarded as a variety of this species. The red-stemmed Boletus, *B. erythropus* Pers., is also indicated as a variety of it by Fries. It is smaller than *B. luridus*, has a brown or reddish-brown pileus and a slender cylindrical stem, not reticulated, but dotted with squamules. It has been reported from California by Harkness and Moore.

Boletus purpureus Fr.

Purple Boletus

Hym. Eur. p. 511. Syl. Fung. Vol. VI, p. 35

Pileus convex, opaque, dry, *somewhat velvety*, *purplish-red*, flesh in the young plant only becoming blue, then dark-yellow; tubes nearly free, yellow or greenish-yellow, their mouths minute, *purple-orange*, changing to blue where wounded; stem stout, firm, adorned with purple veins or dots, sometimes reticulated at the apex only, yellow, reddish within, especially at the base; spores greenish-brown, .0004 to .0005 in. long, .0002 to .00025 broad.

Pileus 2 to 4 in. broad; stem 2 to 4 in. long, 6 to 8 lines thick.

Woods. North Carolina, *Curtis*. New York, *Peck*. Minnesota, *Johnson*.

The species is easily recognized by the velvety appearance of the pileus. The color sometimes fades to yellowish on the margin. The stem is sometimes merely scurfy.

Boletus vermiculosus Pk.

Wormy Boletus

Rep. 23, p. 130

Pileus broadly convex, thick, firm, *dry*, glabrous or very minutely tomentose, brown, yellowish-brown or grayish-brown, sometimes tinged with red, flesh white or whitish,

quickly changing to blue where wounded; tubes plane or slightly convex, nearly free, yellow, their mouths small, round, brownish-orange, becoming darker or blackish with age, changing promptly to blue where wounded; stem subequal, firm, *even*, paler than the pileus; spores ochraceous-brown, .0004 to .0005 in. long, .00016 to .0002 broad.

Var. *Spraguei.* (*Boletus Spraguei* Frost, Bull. Buff. Soc. p. 102.) Stem yellow above, minutely velvety below.

Pileus 3 to 5 in. broad; stem 2 to 4 in. long, 4 to 10 lines thick.

Woods. New York, *Peck.* Ohio, *Morgan.* New England, *Frost.*

The species is separated from *B. luridus* by its dry pileus, white flesh, even stem, which is neither reticulated nor dotted, and by its smaller spores. I cannot distinguish specimens of *B. Spraguei* received from Mr. Frost, from this species. The name is scarcely appropriate, for specimens are not always badly infested by larvæ.

Boletus subvelutipes N. SP.

VELVETY-STEMMED BOLETUS

Pileus convex, firm, subglabrous, yellowish-brown or reddish-brown, flesh whitish, both it and the tubes changing to blue where wounded; tubes plane or slightly convex, nearly free, yellowish, their mouths small, brownish-red; stem equal or slightly tapering upward, firm, even, somewhat pruinose above, *velvety with a hairy tomentum toward the base*, yellow at the top, reddish-brown below, varied with red and yellow within; spores, .0006 to .0007 in. long, .0002 to .00025 broad.

Pileus 2 to 3 in. broad; stem 2 to 3 in. long, 4 to 6 lines thick.

Woods. New York, *Peck.*

This species resembles the preceding one in general appearance, but it is very distinct by its much longer spores and by the velvety hairiness toward the base of the stem.

Boletus firmus Frost

Firm Boletus

Bull. Buff. Soc. 1874, p. 103

Pileus convex, *very firm*, slightly tomentose, *gray*, often lacunose, flesh *yellowish or deep-yellow*, changing to blue where wounded; tubes *adnate*, deeply arcuate, unequal, yellow, their mouths *tinged with red;* stem solid, hard, *very finely reticulated*, yellowish, reddish at the base; spores .0005 in. long, .00012 broad.

Pileus 2.5 to 4 in. broad; stem 2 to 4 in. long.

Rich moist wood. New England, *Frost.*

Apparently a well marked and very distinct species. According to the author it is readily distinguished by its tenacity and generally distorted growth. I have not seen it nor the next.

Boletus magnisporus Frost

Large-spored Boletus

Bull. Buff. Soc. 1874, p. 103

Pileus convex, firm, tomentose, *golden-yellow;* tubes *scarcely adnate*, even, greenish-yellow, their mouths light cinnabar-red; stem long, slender, yellow above, red below; spores .0006 to .0007 in. long, .00025 broad.

Pileus 2.5 to 3.5 in. broad.

Woods and thickets. New England, *Frost.* Ohio, *Morgan.*

Mr. Morgan remarks that the tomentum of the pileus is sometimes brownish-yellow, that the flesh is greenish-yellow

and changes to blue where wounded. The plant apparently resembles *Boletus auriflammeus* in color, but the absence of any pulverulence, the larger size and changeable flesh will separate it. The different color and larger spores distinguish it from *B. firmus.*

Boletus Frostii Russell

Frost's Boletus

Bull. Buff. Soc. 1874, p. 102

Pileus convex, polished, shining, *blood-red,* the margin thin, flesh scarcely changing to blue; tubes nearly free, greenish-yellow, becoming yellowish-brown with age, their mouths blood-red or cinnabar; stem equal or tapering upward, distinctly reticulated, firm, blood-red; spores .0005 to .0006 in. long, .0002 broad.

Pileus 3 to 4 in. broad; stem 2 to 4 in. long, 3 to 6 lines thick.

Grassy places under trees or in thin woods. New England, *Frost.* New York, *Peck.* New Jersey, *Ellis.*

This is a highly colored, beautiful Boletus, but it is not common. The stem sometimes fades with age, and both it and the tubes are apt to lose their color in drying.

Boletus Sullivantii B. & M.

Sullivant's Boletus

Syl. Fung. Vol. VI, p. 36

Pileus hemispherical, glabrous, reddish-tawny or brown, brownish when dry, tessellate-rimose; tubes free, convex, medium size, angular, longer toward the margin, their mouths reddish; stem solid, violaceous at the thickened base, red-reticulated at the apex, expanded into the pileus;

spores pallid-ochraceous, oblong-fusiform, .0004 to .0008 in. long.

Pileus 3 to 4 in. broad; stem 1.5 to 3 in. long.

Compact soil. Ohio, *Sullivant.*

The species is said to be intermediate between *Boletus scaber* and *B. edulis.* From the former it differs in its reticulated stem, from the latter, in its larger tubes and from both in its stratum of tubes being remote from the stem. I have not seen it.

VERSIPELLES

Tubes at first white or whitish, minute, round, equal, forming a convex stratum free from the stem.

The species of this tribe have their tubes typically free or nearly so. They are at first white or whitish and their mouths are not differently colored. The stem may be scabrous or punctate-squamulose, but it is not reticulated with veins. Fries adds to the diagnosis here given, "spores ferruginous, in number 74 umber." But it is so evident that spore color is not available for grouping into tribes that I have disregarded it. The Favosi differ from this tribe in having the tubes large, angular, unequal and adnate. We have no representatives of these unless *Boletus sordidus* Frost is one. Morgan describes its pores as large and angular, but as they are nearly free I have placed the species with the Versipelles for the present.

	Stem black	B. alboater.
	Stem some other color	1
1.	Stem yellow at the base	B. chromapes.
1.	Stem not yellow at the base	2
2.	Margin of the pileus appendiculate	B. versipellis.
2.	Margin not appendiculate	3
3.	Stem scabrous or punctate-squamulose	B. scaber.
3.	Stem even	4
4.	Pileus white or whitish	B. albellus.
4.	Pileus dark-brown	B. sordidus.

Boletus alboäter Schw.

Black and white Boletus

Syn. Fung. Car. 864

Pileus convex, subtomentose-velvety, black; tubes free, their mouths rather small, white; stem black.

Pileus 3 in. broad; stem 2 in. long.

Moist woods. Frequent. North Carolina and Pennsylvania, *Schweinitz.*

In Epicrisis, p. 424, Fries adds to the description here quoted, that the stem is flocculose-veiled. He subjoins to this as a subspecies, *Boletus floccosus* Schw.; but in Syn. N. A. Fung., Schweinitz makes this a synonym of *Boletus floccopus.* The species does not appear to have been recognized by recent collectors, which seems strange unless there is some error concerning it. Can it be a black variety of *Boletus scaber?*

Boletus sordidus Frost

Sordid Boletus

Bull. Buff. Soc. 1874, p. 105

Pileus convex, subtomentose, dirty dark-brown, flesh white, slightly tinged with green; tubes long, nearly free, at first white, changing to bluish-green; stem smaller at the top, brownish, marked with darker streaks, generally greenish above; spores .0004 to .0005 in. long, .0002 broad.

Pileus about 2 in. broad.

Recent excavations in woods. New England, *Frost.* Ohio, *Morgan.*

The Ohio plant occurs in damp woods, has the flesh sometimes tinged with red and green, the tubes white, then sordid, but changing to bluish-green when bruised, their

mouths large and angular, the stem somewhat flexuous and striate and the spores fusiform and dirty-brown.

Boletus versipellis Fr.

Orange-cap Boletus

Hym. Eur. p. 515. Syl. Fung. Vol. VI, p. 40

Pileus convex, *dry*, at first compact and minutely *tomentose*, then squamose or smooth, reddish or orange-red, the margin *appendiculate* with the inflexed remains of the membranous veil, flesh white or grayish; tubes at first concave or nearly plane, almost or quite free, minute, sordid-white, their mouths gray; stem equal or tapering upward, solid, rugose-squamose, whitish or pallid; spores oblong-fusiform, .00055 to .0007 in. long, .00016 to .00025 broad.

Pileus 2 to 6 in broad; stem 3 to 5 in. long, 4 to 10 lines thick.

Woods and open places, especially in sandy soil. North Carolina, *Curtis.* New England, *Frost.* New York, *Peck.* California, *Harkness, Moore.*

The fragments of the membranous veil, which adhere to the margin of the pileus, afford the most available character by which to separate this species from *Boletus scaber.* The prevailing reddish or orange hue of the pileus scarcely differs from that of var. *aurantiacus* of that species. In American specimens the stem is precisely alike in both species. Fries says that the two appear to be distinct but are defined with difficulty on account of analogy in color and variation in stature. It is recorded as edible, but Gillet says it is scarcely to be commended.

Boletus scaber Fr.

Scabrous-stemmed Boletus

Hym. Eur. p. 515. Syl. Fung. Vol. VI, p. 41

Pileus convex, *glabrous, viscid when moist,* at length rugulose or rivulose; tubes free, convex, white, then sordid, their mouths minute, rotund; stem solid, attenuated above, *roughened with fibrous scales;* spores oblong-fusiform, snuff-brown, .00055 to .0007 in. long, .00016 to .00025 broad.

Pileus 1 to 5 in. broad; stem 3 to 5 in. long, 3 to 8 lines thick.

Woods, swamps and open places. Very common and appearing through summer and autumn.

This may fairly be called our most common and variable species. It is recorded in nearly every local list of fungi. The pileus is convex, hemispherical or even subconical. It may be glabrous, minutely tomentose, subvelvety or squamulose. The flesh is white or whitish and sometimes slightly changeable where wounded. The tubes are generally rather long and with a rounded or convex surface. The stem is distinctly scabrous or roughened with small blackish-brown or reddish dots or scales, the ground color generally being whitish, grayish or pallid. The spores have been described as pale-brown and light-yellowish. When caught in a mass on white paper they appear to me to approach snuff-brown, being a paler brown than those of *Agaricus campestris* and darker than those of *Boletus ornatipes.* The viscidity of the pileus is not always clearly discernible. Indeed the pileus is often quite as dry as in *B. versipellis.* When moistened by heavy rains it sometimes is smooth and clammy to the touch but scarcely viscid. Several varieties have been indicated which are expressive of the variations in the color of the pileus.

Var. *testaceus.* Pileus brick-red.

Var. *aurantiacus.* Pileus orange or orange-red.

These appear to connect this species and *B. versipellis.*

Var. *alutaceus.* Pileus yellowish tan color.

Var. *fuligineus.* Pileus fuliginous or cinereous-fuliginous.

Var. *fuscus.* Pileus brown or dark-brown.

Var. *olivaceus.* Pileus olivaceous.

Var. *niveus.* Pileus white, when old sometimes stained with blue or livid-blue.

To these might be added

Var. *areolatus.* Pileus rimose-areolate.

Var. *mutabilis.* Flesh changing slightly to brown or pinkish where wounded.

Var. *gracilipes.* Stem very slender, 2 to 3 inches long, 2 to 3 lines thick; pileus thin, translucent when held toward the light.

This Boletus is classed among the edible species, but it is said to be less agreeable than *B. edulis.*

Boletus albellus Pk.

Whitish Boletus.

Rep. 41, p. 77

Pileus convex or gibbous, soft, glabrous, whitish, flesh white, unchangeable; tubes convex, free or nearly so, small, subrotund, whitish, unchangeable; stem *glabrous or minutely furfuraceous,* substriate, *bulbous or thickened at the base,* whitish; spores brownish-ochraceous, .00055 to .00065 in. long, .0002 to .00025 broad.

Pileus 1 to 2 in. broad; stem 1 to 2 in. long, 3 to 6 lines thick.

Woods. New York, *Peck.*

This is closely related to *B. scaber,* of which it may possibly prove to be a dwarf form; but it is easily distinguished by its smooth or only slightly scurfy and subbulbous stem.

It presents no appearance of the colored dot-like squamules which are a constant and characteristic feature of that species.

Boletus chromapes Frost

Chrome-footed Boletus

Bull. Buff. Soc. 1874, p. 105

Pileus convex or nearly plane, slightly and sometimes fasciculately tomentose, pale-red, flesh white, unchangeable; tubes subadnate, more or less depressed around the stem, white or whitish, becoming brown; stem equal or slightly tapering upward, *scabrous-punctate*, whitish or pallid, *chrome-yellow at the base both without and within*, sometimes reddish above; spores oblong, .00045 to .00055 in. long, .00016 to .0002 broad.

Pileus 2 to 4 in. broad; stem 2 to 4 in. long, 4 to 6 lines thick.

Woods. New England, *Frost.* New York, *Peck.*

The yellow base of the stem appears to be a peculiar and constant character by which the species may easily be recognized. It imitates *Boletus piperatus* in this respect, but in every thing else it is very distinct from that plant. Sometimes the stem is so badly infested by larvæ that it is difficult to procure a sound specimen. The spores have a subferruginous color with a slight incarnate tint, but the scabrous-dotted stem indicates a relationship with *B. scaber.* Through this species, *Boletus conicus* and *B. gracilis*, the Versipelles and the Hyporhodii appear to run together. In the Catalogue of Plants of Amherst the specific name is "chromapus." It would be more in accordance with present custom to write it "chromopus."

HYPORHODII

Tubes adnate to the stem, whitish, then white-incarnate from the rosy spores.

In this tribe the tubes are at first whitish, but with the development of the spores they usually assume a pinkish or flesh-colored hue. Wounds of the tubes in some species cause a change in color but not to blue, nor are the tube mouths differently colored as in the Luridi. The stem in some is more or less reticulated but this is scarcely a constant or reliable character in these species. Typically the spores are rosy or flesh-colored, but I have admitted species in which they incline to ferruginous, giving more weight to the color of the tubes than to that of the spores.

	Pileus black or blackish	B. nigrellus.
	Pileus some other color	1
1.	Stem more than four lines thick	2
1.	Stem slender, generally less than four lines thick	B. gracilis.
2.	Stem not reticulated	3
2.	Stem more or less reticulated	4
3.	Tubes angular, flesh-colored	B. conicus.
3.	Tubes round, white	B. alutarius.
4.	Taste mild	B. indecisus.
4.	Taste bitter	B. felleus.

Boletus conicus Rav.

CONICAL BOLETUS

Ann. Mag. Nat. Hist. 1853, p. 14

Pileus convex or *subconical*, clothed with fasciculate appressed *yellowish flocci*, flesh white, unchangeable, tasteless; tubes ventricose, flesh-colored, becoming darker from the spores, the mouths small, angular, subfimbriate; stem glabrous, tapering upwards, pale-yellow; spores fusiform, subferruginous.

Pileus 1 to 2 in. broad; stem 2 in. long, 6 lines thick.

Damp pine woods. South Carolina, *Ravenel.*

The species is compared to *Boletus scaber*, from which it differs in its smaller tubes and smooth stem, and from both this and *B. albellus* it differs in the color of the tubes and in the yellowish flocci of the pileus. I have seen no specimens but on account of the color of the tubes I have placed the species with the Hyporhodii.

Boletus gracilis Pk.

Slender Boletus

Rep. 24, p. 78

Pileus convex, glabrous or minutely tomentose, rarely squamulose, ochraceous-brown, tawny-brown or reddish-brown, flesh white; tubes plane or convex, depressed around the stem, nearly free, whitish, becoming pale flesh-colored, their mouths subrotund; stem *long, slender*, equal or slightly tapering upward, pruinose or minutely furfuraceous, even or marked by slender elevated anastomosing lines which form long narrow reticulations; spores subferruginous, .0005 to .0007 in. long, .0002 to .00025 broad.

Var. *lævipes*. Stem even.

Pileus 1 to 2 in. broad; stem 3 to 5 in. long, 2 to 4 lines thick.

Woods. New York, *Peck*. New England, *Frost*. Ohio, *Morgan*.

The slender habit separates this species from all the others here included in this tribe. Its spores are not a clear incarnate in color but incline to dull ferruginous and by this character this and the preceding species connect this tribe with Versipelles. In color *B. gracilis* resembles some forms of *B. felleus*, but in size, habit and color of spores it is easily distinct. The tomentum of the pileus sometimes breaks into tufts or squamules. This is *Boletus vinaceus* Frost Ms.

Boletus indecisus Pk.

UNDECIDED BOLETUS

Rep. 41, p. 76

Pileus convex or nearly plane, dry, slightly tomentose, ochraceous-brown, often wavy or irregular on the margin, flesh white, unchangeable; taste *mild;* tubes nearly plane or convex, *adnate*, grayish, becoming tinged with flesh-color when mature, changing to brownish where wounded, their mouths small, subrotund; stem minutely furfuraceous, straight or flexuous, *reticulated above*, pallid without and within; spores oblong, *brownish flesh-color*, .0005 to .0006 in. long, .00016 broad.

Pileus 3 to 4 in. broad; stem 2 to 4 in. long, 4 to 6 lines thick.

Thin oak woods. New York, *Peck.*

The mild taste and darker colored spores will separate this Boletus from any form of *B. felleus.* Its stem reticulated above distinguishes it from *B. alutarius.* It resembles *B. modestus* in some respects but its tubes are not at all yellow.

Boletus alutarius Fr.

TAN-COLORED BOLETUS

Hym. Eur. p. 516. Syl. Fung. Vol. VI, p. 43

Pileus convex, then nearly plane, soft, *velvety*, becoming glabrous, *brownish tan color*, flesh almost unchangeable, taste *mild*, *watery;* tubes depressed around the stem, plane, short, round, white, becoming brownish where wounded; stem solid, bulbous, nearly even, *scrupose at the top;* spores .00055 in. long, .00016 broad.

Pileus 3 to 4 in. broad; stem 4 to 5 in. long.

Grassy woods. Minnesota, *Johnson.*

Boletus felleus Bull.

Bitter Boletus

Hym. Eur. p. 516. Syn. Fung. Vol. VI, p. 43

Pileus convex or nearly plane, firm, becoming soft, *glabrous*, even, variable in color, pale-yellowish, grayish-brown, yellowish-brown, reddish-brown or chestnut, flesh white, often changing to flesh-color where wounded, taste *bitter;* tubes adnate, long, convex, depressed around the stem, their mouths angular, white, becoming tinged with flesh-color; stem variable, equal or tapering upward, short or long, sometimes bulbous or enlarged at the base, subglabrous, generally reticulated above, colored like or a little paler than the pileus; spores oblong-fusiform, flesh-colored, .0005 to .0007 in. long, .00016 to .0002 broad.

Var. *obesus*. Pileus large, stem thick, coarsely and distinctly reticulated nearly or quite to the base.

Pileus 3 to 8 in. broad; stem 2 to 4 in. long, 6 to 12 lines thick.

Woods and open places. Common. North Carolina, *Schweinitz, Curtis.* Pennsylvania, *Sehweinitz.* New York, *Peck.* New England, *Frost.* Ohio, *Morgan.* Wisconsin, *Bundy.* Minnesota, *Johnson.* New Jersey, *Ellis.*

This Boletus often occurs on or about much decayed stumps and prostrate trunks of hemlock. A favorite habitat is in soil largely composed of decayed wood and vegetable matter. It is easily recognized by its bitter taste, from which it takes its name.

The variety is large and solitary in its mode of growth. It is remarkable for the coarse reticulations of the stem which extend nearly or quite to the base. After heavy rains the pileus is viscid. It may prove to be a distinct species.

The flesh in the American plant does not always assume incarnate hues where wounded. The color of the fresh tubes often changes to a deeper tint where wounded.

Boletus nigrellus Pk.

BLACKISH BOLETUS

Rep. 29, p. 44

Pileus broadly convex or nearly plane, dry, subglabrous, *blackish*, flesh soft, white, unchangeable; tubes plane or convex, adnate, sometimes slightly depressed around the stem, their mouths small, subrotund, whitish, becoming flesh-colored, slowly changing to *brown or blackish where wounded;* stem equal, short, *even*, colored like or a little paler than the pileus; spores dull flesh-colored, .0004 to .0005 in. long, .0002 to .00025 broad.

Pileus 3 to 6 in. broad; stem 1.5 to 2.5 in. long, 6 to 12 lines thick.

Woods and copses. New York, *Peck.*

The blackish color of the pileus and stem distinguishes this species. From *Boletus alboater* Schw., the adnate, flesh-colored tubes will separate it. The surface of the pileus sometimes becomes rimose-areolate.

CARIOSI

Stem never reticulated, stuffed with a spongy pith, at length commonly excavated. Tubes at first white, then often yellowish, their mouths minute, round.

Fries adds to these characters, "spores white." But in our species the spores are pale-yellow when shed in a mass on white paper. They are more elliptical in outline than the spores of most Boleti. The character of the stem is peculiar and easily distinguishes the tribe. The exterior is firm, the interior soft and spongy, becoming irregularly hollow or cavernous in the typical species.

Flesh unchangeable	1
Flesh quickly changing to blue where wounded	B. cyanescens.
1. Pileus minutely velvety-tomentose	B. castaneus.
1. Pileus granulated	B. Murrayi.

Boletus cyanescens Bull.

Bluing Boletus

Hym. Eur. p. 517. Syl. Fung. Vol. VI, p. 44

Pileus convex or nearly plane, opaque, floccose-squamose or covered with an appressed tomentum, pale-buff, grayish-yellow, alutaceous or somewhat brown, flesh rigid, white, *quickly changing to blue where wounded;* tubes free, white, becoming yellowish, the mouths minute, round, changing color like the flesh; stem ventricose, villose-pruinose, stuffed, becoming cavernous, contracted and even at the top, colored like the pileus; spores subelliptical, .0004 to .0005 in. long, .00025 to .0003 broad.

Pileus 2 to 5 in. broad; stem 2 to 4 in. long, 8 to 18 lines thick.

Woods and open places. New York, *Peck.* New England, *Frost, Bennett.* Minnesota, *Johnson.* Wisconsin, *Bundy.*

This well-marked and very distinct species appears to be northern in its range. The color of the American plant, so far as I have seen it, is buff-yellow or grayish-yellow, but brownish hues are attributed to the European plant. When fresh, wounds of the flesh or tubes quickly assume a blue color which soon fades to violet or purple and finally disappears. The European plant is said to exude a blue juice under pressure.

Boletus castaneus Bull.

Chestnut Boletus

Hym. Eur. p. 517. Syl. Fung. Vol. VI, p. 45

Pileus convex, nearly plane or depressed, firm, even, dry, minutely *velvety-tomentose, cinnamon or reddish-brown,* flesh white, unchangeable; tubes free, short, small, white becom-

ing yellow; stem equal or tapering upward, even, stuffed or hollow, clothed and colored like the pileus; spores .0004 to .0005 in. long, .00025 to .0003 broad.

Pileus 1.5 to 3 in. broad; stem 1 to 2.5 in. long, 3 to 5 lines thick.

Woods and open places. Rather common and wide spread.

The pileus and stem are often reddish-brown or chestnut colored, but sometimes they are paler, inclining to tawny or cinnamon hues. The thin margin sometimes curves upward and then dried specimens strongly resemble those of *Boletus Roxanæ.* The plant has been recorded edible, but Gillet says it is of a moderate quality.

Boletus Murrayi B. & C.

MURRAY'S BOLETUS

Grevillea, Vol. I, p. 36

Pileus hemispherical, *granulated, vivid red,* flesh *yellow;* tubes decurrent, about one line deep, yellow; stem clavate, even, pale-yellow; spores pale-yellow.

Pileus 2 to 3 in. broad, nearly 1.5 thick.

New England, *Murray.*

On account of the color of the spores this species has been placed with the Cariosi. The description does not mention the character of the interior of the stem, and the decurrent tubes depart from the character of the typical species so that its true position is uncertain. The species seems well marked by the character of the pileus.

STROBILOMYCES Berk.

Hymenophore even. Tubes not easily separable from it, large, equal. Pileus and stem distinctly squarrose-squamose, the flesh tough.— Syl. Fung. Vol. VI, p. 49.

I have given Professor Saccardo's emended diagnosis of this genus, because it expresses what appears to me to be the most important generic character, that is, tubes not easily separable from the hymenophore. By this character and by the tough substance the transition between Boletus and Polyporus is made.

Tubes nearly equal in length ..... S. strobilaceus.
Tubes shortened around the stem ..... S. floccopus.

Strobilomyces strobilaceus Berk.

Cone-like Boletus

Berk. Out. Brit. Fung. p. 236. *Boletus strobilaceus* Scop., Hym. Eur. p. 513

Pileus hemispherical or convex, dry, covered with thick floccose projecting blackish or blackish-brown scales, the margin somewhat appendiculate with scales and fragments of the veil, flesh whitish, changing to reddish and then to blackish where wounded; tubes adnate, whitish, becoming brown or blackish with age, their mouths large, angular, changing color like the flesh; stem equal or tapering upward, sulcate at the top, floccose-tomentose, colored like the pileus; spores subglobose, rough, blackish-brown, .0004 to .0005 in. long.

Pileus 2 to 4 in. broad; stem 3 to 5 in. long, 4 to 10 lines thick.

Woods. North Carolina, *Curtis.* Texas. *Wright.* New York, *Peck, Clinton.* New England, *Frost, Bennett.* Ohio, *Lea, Morgan.* Wisconsin, *Bundy.* New Jersey, *Ellis.*

This species has a peculiar shaggy appearance by reason of its dense coat of blackish-brown floccose tomentum which

separates into more or less prominent and often angular or pyramidal scales, especially on the disk. When young the hymenium is concealed by the floccose whitish veil. *Boletus coniferus*, *B. echinatus* and *B. squarrosus* Pers., are synonyms of this species. In the description of the last one, Persoon says, "the long whitish tubes adhere quite firmly to the pileus but are not truly connate with it as in Polyporus," thus noting the essential character of this genus. In some specimens the tubes next the stem are much larger and more irregular than elsewhere.

Strobilomyces floccopus Vahl.

Floccose-stemmed Boletus

Syl. Fung. Vol. VI, p. 50. *Boletus floccopus*, Hym. Eur. p. 513. *Boletus floccosus*, Syn. Fung. Car. 863. Epicrisis, p. 424

Pileus convex, soft, covered with an areolate-fasciculate squarrose-squamose tomentum, cinereous, at length blackish, appendiculate with the silky, thick annular veil; tubes *shortened behind*, their mouths large, whitish-gray; stem stout, lacunose above, umber-tomentose below; spores perfectly globose, brown, .00036 in. broad.

Pileus 4 to 5 in. broad; stem 4 to 5 in. long, 1 in. thick.

Woods. North Carolina and Pennsylvania, *Schweinitz*. Ohio, *Morgan*. New York, *Peck*.

According to Fries this is a larger and firmer species than *S. strobilaceus* but manifestly related to it. The New York specimens which I have referred to it differ from *S. strobilaceus* in no respect except in the tubes being depressed around the stem. Unless there are other differences in the European plant, it scarcely seems to me to be worthy of specific distinction. *Boletus floccopus*, Rost. tab. 40 is referred to *Boletus scaber*, as is *B. holopus*, Rost. tab. 48.

APPENDIX

The descriptions of the following species are scarcely sufficient to permit of the satisfactory reference of the species to their places in the tribes. It is to be hoped that these plants may again be found and their proper relations be ascertained.

Boletus Ananas Curt.

Am. Jour. Sci. Arts, 2d ser. Vol. VI, p. 351. Grev. Vol. I, p. 36

Pileus pulvinate, thickly and rigidly floccose-verrucose, yellow, flocci white above, flesh-colored beneath, the margin thin, membranous, lacerated; hymenium plane, depressed around the stem, yellow or tawny-yellow, becoming greenish where wounded, their mouths medium size, obtusely angular; stem even, solid, somewhat enlarged at the base, white; spores ferruginous.

Pileus 3 to 4 in. broad; stem 3 to 4 in. long, 6 to 9 lines thick.

Under prostrate trunks of pine trees.

South Carolina, *Ravenel.* North Carolina, *Curtis.*

This is said to approach *S. strobilaceus* in habit but to be otherwise very different. It is placed among the Subtomentosi in Sylloge, but from these it recedes by its floccose wart-like scales.

Boletus radicosus Bundy

Geol. Wisconsin, Vol. I, p. 398

Pileus thin, wide, recurved, yellow tinged with brown, the cuticle easily removed, flesh pale-yellowish tinged with pink, not changing color when bruised; tubes decurrent, large, uneven-mouthed, compound, angular, tinged with brown; stem flexuous, yellow above, whitish below, rough with dark appressed scales, fibrous-rooted.

Pileus 4 in. broad; stem 3 to 4 in. long, 5 lines thick.

Wisconsin, *Bundy*.

The pileus is not described as viscid, but in other respects the species appears to belong to the Viscipelles and to be related to *Boletus collinitus*.

Boletus Pocono Schw.

Syn. N. A. Fung. 314

Pileus pulvinate, cervine, minutely strigose-subtomentose on the closely inflexed margin; tubes rather large, somewhat prominently angular, concolorous; stem subattenuated, thickened toward the base, pallid-striate at the apex, elsewhere spadiceous, subfurfuraceous.

Pileus 1 in. broad; stem 2 to 3 in. long.

Beech woods. Pennsylvania, *Schweinitz*.

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